HORTICULTURAL ABSTRACTS

Vol. XXVI December 1956 No. 4

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EDITORIAL NOTES

We regret that "circumstances beyond our control" have necessitated a rise in the subscription rate as from 1957. The new rate will be 70s. a volume with reduction of 20% to direct subscribers in countries which contribute to the Bureaux. This seems a monstrous lot of money until you start spending it on any single thing you want.

We hope by now most of our readers will have received the composite index to Vols 21–25 in lieu of the normal yearly index.

If lately-joined readers are inspired by it to want earlier volumes in the 21–25 run, they are respectfully urged to order quickly.

SALIENT ITEMS Vol. 26, No. 4.

CLIMATIC EFFECTS.

Low temperature injury:—Among numerous papers on frost damage, resistance and protection four throw light on the physiological and biochemical processes involved in the resistance of plants to low temperatures (3249–3251, 3442).

Water:—Frequent mowing of grass in apple orchards is widely advocated as a means of conserving water, but under some conditions grass kept unmown for several years may have a cumulative retentive effect on soil moisture (3389). In strawberries breaking autumn drought by irrigation can result in very rapid flower bud differentiation (3435). Studies are also reported on soil moisture extraction patterns shown by strawberries (3434), the effects of normal and very hot dry days on the transpiration of orange leaves (4063, 4064), and chemical aspects of waterlogging injury to fruit trees (3490).

Wind damage:—Plant responses may sometimes be unpredictable (3877).

Air pollution:—The injuries caused by air pollutants may or may not show symptoms and can be prevented by various treatments (3245–3248). Beans and tomatoes do not like cement dust on their leaves (3710).

MACHINES, METHODS, ETC.

Harvesting and handling:—Machine harvesting is being tested for grapes (3455) and tobacco (3887). Comparisons between different methods of harvesting and handling crops may lead to reduced costs for apples (3395), celery (3734), melons (3750), peppers (3850) and citrus (4098).

Drying and storage:—For coconuts new methods are available for drying copra and extracting its oil (4153, 4154). For tobacco there are modified flue-curing barns (3888, 3889) and also equipment for hastening or retarding drying (3857, 3890). Vegetables can be cooled with the aid of low pressures (3810), and a breather bag may be used to reduce air leaks when they are in store (3311).

Tools and apparatus:—A wide range of tastes should be catered for by a cheap soil sterilizer (3306), a new hedge cutter (3313), mobile observation platforms for looking at the tops of trees (3586), a water-placement valve for mechanical planters (3886), yet another unit for controlling intermittent mist (3307), a pocket calculator for small volume spraying (3310), and apparatus for collecting pollen (3309) and for measuring plant transpiration (3308) and the height of trees (3314). The use of liquid moulds for radiographing leaf surfaces is also described (3312).

NUTRITION.

Plant composition:—The practical value of leaf analysis as a guide to fertilizer practice is demonstrated in an irrigated citrus orchard survey (4042). Elsewhere many problems require solution before such methods can be generally applied, as for example, what and when to analyse (3379, 3418, 4182, 4209), and how to allow for variations in nutrient status associated with water supply (3383, 3798) and for spray residues and other contaminants (3590).

Application, absorption and leaching:—A sugar cane fertilizer trial in which two quite different treatments produced the best results illustrates a pitfall for the unwary (4210). The responses of crops to nutrients may vary with age (3836, 3864), and with some vegetable crops foliar applications made as late as 3 weeks before harvest may increase yields substantially (3719, 3737). Other papers deal with the depth at which fertilizers are most effective for fruit trees (3380, 3381), cation ratios and the cation-exchange capacity of roots (3733, 4048), the effect of pH on nutrient requirements (3704), factors affecting P absorption (3382) and the application of a P vapour (3833) and of a K frit (3281). Cherries, like citrus, may be injured by biuret in urea sprays (3384). Where plants are kept in a mist the losses through leaching of mineral nutrients may be considerable (3278).

Boron:—Further evidence is presented on the role of B in carbohydrate translocation (3283) and it is also shown to affect transpiration (3284). Among other papers on B (3461–3464) two suggest interactions between this element and Mn, Ca and K.

Copper:—A connexion between Cu and the sugar content of plants is shown in two cases (3781, 3867), and it may be significant that in the first of these both B and Cu increased growth. The correction of kernel shrivelling in almonds by a Cu chelate spray (3465) is also described.

Iron:—New chelates of iron continue to appear (3466, 3467, 4050, 4051), and a further example is given of a chelate applied alone curing chlorosis (4003). Iron-deficiency chlorosis is also the subject of a review (3286) and of a study in relation to N deficiency (4188).

Molybdenum:—Deficiency of Mo is the subject of 8 papers, some straightforward and others concerned with the intricate interactions between Mo and other elements, especially N (3470, 3708, 3721–3725, 3838).

Strontium:—Faintly sinister eddies of nuclear explosions may be detected in 3 papers (3288–3290).

Zinc:—In citrus Zn deficiency may increase flower abscission (4059) and Cu may depress Zn uptake (4054). To correct deficiencies Zn may be applied as a chelate (3471) or mixed with sulphur acaricides (4055).

Odds and ends:—New sources of micronutrients and various minor-element interactions involving Al, Co and Ni may be mentioned (3282, 3285, 3287, 3806), as may bacterial cultures which release nutrients (3702) and various organic soil amendments ranging from sawdust to sewage (3433, 3706, 3709, 4194).

PHYSIOLOGY AND BIOCHEMISTRY.

Growth regulation:—A review draws attention to differences in the patterns of transport between natural and applied auxins (3265). Among natural auxins is one occurring in the roots of juvenile plants, which can, under certain circumstances, rejuvenate mature plants (4020). Among relatively new applied compounds assuming prominence are the growth promotors gibberellic acid and gibberellin (3269–3271, 3799), but they cannot yet claim to have stolen all the limelight from that old star inhibitor of many parts, maleic hydrazide (3377, 3604, 3605, 3797, 3800, 4190). Among many other actors in this highbrow drama are 2,4-D appearing as a growth stimulator (4033), vitamins B and C as respiration accelerators (3260, 3261) and a new ethylene compound called genetron (3272). Perhaps on this occasion, however, the prize should be awarded to EDTA and other chelating agents for providing a possible clue as to how auxin works (3268).

Fruit set and drop:—Pistil development in citrus is affected by the starch content of the shoots (4056) and in olives by the number of leaves present (4119). In black currants fruit drop or running-off, a popular problem some years ago, has suddenly come to the fore again (3412–3416). In cacao fruit drop or cherelle wilt occurs in two main stages, but both appear to be due to lack of hormones (4141). In beans pod drop caused by drought may be reduced by tolylphthalamic acid (3758). Among materials used for fruit thinning NAA increases transpiration sufficiently to cause apple and peach leaves to flag (3369) and may also reduce the number of flower buds formed for the next season (3370). Another example of a carry-over effect, this time beneficial, is provided by 2,4,5-TP used to control pre-harvest drop of pears (3374).

Light and temperature responses:—No number of *H.A.* would be complete without a series of papers illustrating the complex interrelationships between photoperiodism and temperature (3338, 3429, 3796, 3800, 3803, 3823, 3824, 3901, 3975). In addition to regulating flower bud induction photoperiods may influence the form and amount of vegetative growth (3430, 3431, 4028, 4167); plant responses may, however, vary with nutrient supply (3829) and can be changed completely by exposure to gamma rays (3868). Light intensity also affects vegetative growth and fruiting (3827, 3828, 3969) and in some plants may influence the rate of root growth (4015). Perhaps the oddest response is the preference shown by tomatoes for alternating cycles of light and darkness each lasting only 6 seconds (3825). The effects of temperature are no less complicated than those of light (3822, 3902, 3929, 3966, 3974, 3982, 4048, 4116), and may be transmitted by seed from one generation to the next (3755). Finally, as an inspiration to those who may seek to escape from these complexities by quietly retiring to a mental home there is evidence that plants respond to moonlight (3258).

Alkaloid biosynthesis:—Do alkaloids have any physiological function in plants? The answer may have been brought a stage nearer by a series of papers on the biosynthesis of tobacco alkaloids (3871–3874). Changes in the alkaloid content of hellebore roots coinciding with top growth may also conceivably have a bearing on this problem (3900).

PLANT PROTECTION.

General:—Of general interest are an account of methods of producing disease-free planting material (3946), a rapid method of assessing leaf spot infection on black currants (3522), and simple methods of obtaining transparent impressions of plant surfaces and spray deposits (3585).

Virus diseases:—The tolerance of strawberry plants to hot-water therapy is affected by temperatures preceding treatment (3589). The big-vein disease of lettuce may be reduced by several chemicals (3808). Leaves kept in darkness lose certain organic acids and also become more susceptible to viruses, but there is no evidence that the two effects are related (3764, 3765).

Birds and beasts:—Four compounds are recommended as rabbit repellents (3571) and now at last there is one said to repel birds (3573). Against orchard mice endrin shows promise (3570).

Chemicals, natural and manufactured:—Among natural compounds are insecticidal infusions prepared from several drug plants (3916), a bactericide from a lichen (3897), cinnamic acid and other apple metabolites with anti-fungal properties (3501), patulin produced in apples by one fungus possibly to discourage others (3511), and limonene from orange oil, which is ineffective against fungi when fresh but becomes lethal following irradiation (4105). Among other fungicides and insecticides captan and zineb may be combined with advantage to control apple diseases (3500) and azobenzene added to certain acaricides may overcome mite resistance (4005). Bordeaux mixture may sometimes depress the growth of grape vines (3579), but as a much cheaper substitute is now available, described as pyrite cinders, this may not matter very much (3711). Salts releasing ammonia offer a new means of controlling moulds in packed citrus fruit (4109).

Soil sickness and sterilization:—The causes and control of soil sickness and the fruit tree replant problem are discussed (3472–3474, 3538), and in one paper (3473) it is shown that in peaches the suspect glycoside amygdalin occurs in particularly high concentration in the root bark. In citrus orchards affected by nematodes it is suggested that cover crops that have proved inimical to the nematodes should be planted (4094). Where pre-planting fumigation is practised the bromide in EDB may be more toxic to some plants than to others (4095).

PROPAGATION.

Seeds:—Coffee seeds can be sun-dried without harm provided their moisture content remains above 7% (4164). A decline in the viability of stored tobacco seeds is accompanied by marked chemical changes (3876). Among several accounts of viability tests two describe the use of resazurin (3297, 4037). Methods of improving or hastening germination include the use of immature seeds (4021), treatment with potassium nitrate (3298), with colchicine (3421), and, in some cases only, with chlorine (3420), and soaking followed by sun-drying to promote cracking (3336). A review on the physiology of germination and a study on the roles of seed coat and temperature in the development of apple seeds may also be mentioned (3296, 3337).

Cuttings:—The author of a new book on plant propagation (4270) is a mist enthusiast, and this method is now being used to raise many deciduous fruit varieties (3340, 3341). With hardwood gooseberry cuttings the retention of the lower buds is beneficial in cuttings taken early but harmful in those taken later (3424). With some quinces rooting capacity and resistance to lime-induced chlorosis seem to be inversely related (3469). Rooted cuttings may be stored for long periods in polythene bags, given suitable temperatures (3951).

Rootstock-scion relations:—In apples the initial growth characteristics of the scion, whether juvenile or mature, depend on the physiological age of the buds used (3328). In citrus the growth habit of the scion resembles that of the stock (4038), and the stock also influences the width of scion vessels (4039).

MISCELLANEOUS.

Automation?—Redundancy among lettuce thinners (3804).

Dropping the onion:—Not more than 4 ft. please (3782).

Oyster mushrooms:—Grown on sawdust (3773).

Pollen:—Storage and germination (3752, 4058, 4120).

Roots:—Phasic growth in tomatoes (3821) and variations in root-cap structure in different media (4014).

Statistical matters:—General (3239–3242) and specific (3317, 3318, 3813).

Topsyturvydom:—Or how to make annual hop stems perennial (3911).

Vandalism?—May we with due hesitancy suggest 3941 as suitable reading for the dons of a well known university?

MISCELLANEOUS.

General.

(*See also* 4258, 4259, 4265, 4274, 4276, 4277, 4282, 4285, 4292, 4294d, g, j, k, m-p, r.)

3235. Hodge, W. H., and others.
Federal plant introduction gardens.
Nat. hort. Mag., 1956, **35**: 86-106, bibl. 1, illus.

An account is given of the Plant Introduction Gardens at Coconut Grove in Florida, Chico in California, Glenn Dale in Maryland and Savannah in Georgia. The more notable collections of species and varieties are mentioned; these not only include many temperate and subtropical fruit and ornamental plants, but also germoplasm collections of tropical plantation crops such as hevea, coffee and cacao. [See also *H.A.*, 26: 1290.]

3236. Bornás y de Urcullu, G.
El registro de variedades de plantas. **(The register of plant varieties.)**
An. Inst. nac. Invest. agron. Madrid, 1955, **4**: 159-84.

In 1947 the National Institute of Agronomic Research in Madrid was authorized to compile a comprehensive register of plant varieties [see *H.A.*, 24: 2128] with the following aims: (1) to delimit, name and publish information on new plant forms (strains, clones, etc.); (2) to determine by means of comparative trials the varieties most suitable for growing in the various regions of Spain, and to prepare lists of recommended varieties; (3) to protect the rights of plant breeders. Up to the present work has been done on 6 agricultural crops, carnations and roses [see abstract 3955]. Information is here given on the organization of the work, on its relationship to international bodies and on similar work being done in other countries.

3237. Dodds, K. S.
Hybrid vigour in plant breeding.
Proc. roy. Soc. Ser. B, 1955, **144**: 185-92, bibl. 23.

Since maximal expression of heterosis is found in F_1 hybrids and hence in crops raised from seed, the crosses must be repeated to keep up a continuous supply of planting material. Suitable conditions are afforded by such crops as tomatoes, eggplants, cucurbits and onions, for in them the flowers are relatively large and easily handled and one pollination produces many seeds. Moreover, the produce from a single plant has a significant commercial value. The potential value of hybrid vigour has been shown in the production of F_1 hybrid seed of onions and tomatoes. In many fruits and some vegetables propagated as clones there seems little to be gained by an attempt to use hybrid vigour, thus it would seem that most cultivated raspberries have been selected for hybrid vigour and that particular fruit varieties are already highly efficient representatives of their kind. Their shortcomings in yield are unlikely to be overcome by searching for improved vigour.

3238. OEEC.
Fruit and vegetables—producer to consumer.
Suppl. FATIS Rev., 1956, pp. 69, illus., **5s.**, 250 French fr., or $1, 2 rue André-Pascal, Paris 16^{e}.

A symposium of short articles by experts on problems of exceptional interest to horticulturists. They concern: fruit tree rootstocks—English work; pest control methods; coordination of European plant protection; trends in French fruit growing; modern packing stations—especially north Italian experience; trade standardization; auctions—in the Netherlands; growing under glass; crop forecasting in Switzerland; market news services; consumption levels in western Europe. [Others by Philp, Nosti Nava, Lecrenier, Verlot and Grellier are abstracted separately.]

Statistical design.

(*See also* 3317, 3318, 3813.)

3239. Hanson, W. D.
General concept of and considerations for the use of variance components.
Proc. Amer. Soc. hort. Sci., 1955, **66**: 403-9, bibl. 8.

The general concept of variance components is discussed, the distinction being made between random effects as shown in plots and blocks and fixed effects due to treatment. The estimation of variance components from mean squares in the analysis of variance is explained with suggestions on the design of experiments for this purpose, and on the assigning of approximate fiducial limits to the estimates. G.M.J.

3240. Monroe, R. J., and Mason, D. D.
Problems of experimental inference with special reference to multiple location experiments and experiments with perennial crops.
Proc. Amer. Soc. hort. Sci., 1955, **66**: 410-14, bibl. 3.

The inferences are discussed that can be drawn from analyses of variance containing treatment, location, treatment × location and possibly also seasons, season × treatment, season × location and season × treatment × location mean squares. It is necessary to consider whether the locations (or seasons) can be regarded as a random sample of all possible locations (or seasons), or whether they constitute the entire population of locations (or seasons) under study. Suggestions are made for obtaining information on season × location effects with regard to perennials. G.M.J.

3241. SHARPE, R. H., AND VAN MIDDELEM, C. H.
Application of variance components to horticultural problems with special reference to a parathion residue study.
Proc. Amer. Soc. hort. Sci., 1955, **66**: 415-20, bibl. 9.

Several illustrations are given of the use of variance components to improve experimental technique, principally in regard to sampling problems. G.M.J.

3242. PEARCE, S. C.
Experimentation with perennial plants.
[*Publ.*] *F.A.O. 55/8/5513*, Rome, 1954, pp. 51, bibl. 117.

Lectures on experimental design and analysis, and of the variations to be reckoned with in planning.

Economics.

(*See also* 3396, 3408g, i, j, 3750.)

3243. KOOYMAN, P., VAN NES, A. R., AND SCHEER, C. D.
Bedrijfsbeoordeling door middel van kengetallenvergelijking. (**Advice on horticultural management with the aid of a comparison of basic data.**) [English summary ¼ p.]
Meded. Dir. Tuinb., 1956, **19**: 315-24, bibl. 2.

The authors discuss the value and use of a German method which has been developed to provide advice on horticultural management. Comparison of data prepared from simple financial accounts must be supplemented by a more detailed analysis of holding and management. Application of the method can give useful insight into the way a business is carried on.

3244. FJÄDERHANE, A. M.
Arbetsstudier i trädgårdsodlingen. (**Time studies in horticulture.**) [List of contents in English.]
Medd. Alnarpsinst. trädgårdsekon. Byrån **21**, 1956, pp. 53, illus.

The results of detailed time studies are presented for a variety of operations in the glasshouse culture of flowers and tomatoes, in ornamental and fruit nurseries, and for some miscellaneous tasks. [For an outline of this time study scheme see *H.A.*, 23: 1434.]

Climatic factors.

(*See also* 3316a, l, 3477.)

3245. MIDDLETON, J. T., AND OTHERS.
Plant damage by air pollution.
Calif. Agric., 1956, **10**(6): 9-12, illus.

Plant injury caused by ethylene, fluorides, herbicides, oxidized hydrocarbons, ozone and sulphur dioxide is described and illustrated with coloured photographs.

3246. TODD, G. W., MIDDLETON, J. T., AND BREWER, R. F.
Effects of air pollutants.
Calif. Agric., 1956, **10**(7): 7-8, 14, illus.

In controlled studies bean growth was reduced without visible leaf damage by exposure to fumes of ozonated petrol. Vines and gladioli grown in a hydrogen fluoride atmosphere showed decreased growth and some injury; citrus trees were not affected. Photosynthesis and chlorophyll content of *Lemna* were reduced by treatment with ozonated hexene or ozone. Both gases stimulated respiration of lemon fruits and bean plants [see also *H.A.*, 26: 1009]. Ozonated hexene first caused a decrease in cell permeability in bean leaf tissue, and then increased permeability. Bean leaves only showed visible injury at the second stage. Exclusion of the naturally-occurring California air pollutants from the environment of Kentia palms resulted in a normal healthy colour and more rapid growth. Reduced growth in Mexican avocado seedlings was caused by 6 months' exposure to ozonated petrol.

3247. TODD, G. W.
"Hidden damage" to plants as caused by air pollutants.
From abstr. in *Plant Physiol.*, 1956, **31** (Suppl.): xv.

Significant decreases in linear growth, fresh and dry weights and leaf area were found when Red Kidney and Bountiful beans were subjected to several fumigations of low concentrations of an artificial smog. Mature leaves on fumigated plants which were not fully expanded did not attain normal size and abscissed prematurely. The water content of treated plant stems was greater than in control plants, but there was no difference in the leaf water content.—Univ. Calif., Riverside.

3248. KENDRICK, J. B., JR., AND OTHERS.
Plant response to polluted air.
Calif. Agric., 1956, **10**(8): 9-10, 15, illus.

Field observations and controlled fumigation studies have shown that plants differ in their response to atmospheric contamination by ethylene, herbicides, fluorides, sulphur dioxide and oxidized hydrocarbons. Plants known to be susceptible or resistant to air pollutants are listed. Spinach, lettuce and endive showing symptoms of N deficiency were less severely damaged by oxidated hydrocarbon fumigation than plants receiving adequate N. Glasshouse lettuce and beans grown under water stress were much more resistant to fumigation by oxidized hydrocarbons than those with adequate moisture. Lettuce, spinach and endive were more susceptible to oxidized hydrocarbons when grown at 55° F. than at 75° F. Leaves on new growth flushes of sweet and sour orange seedlings were damaged by sulphur dioxide when the plants were grown in a glasshouse; no injury was observed on leaves which developed outside during the winter. Chemicals belonging to the dithiocarbamate, benzothiazole and thiuram sulphide groups, particularly zineb and thiram, applied to the lower leaf surface can prevent inujry by ozone and ozonated hexene. Injury in greenhouses can be prevented by passing the incoming air through an activated carbon filter.

3249. Genkelj, P. A., and Oknina, E. Z.
The estimation of frost resistance in plants according to the depth of dormancy in their tissues and cells. (Instructions for use of the method.) [Russian.]
Izd. Akad. Nauk S.S.S.R., 1954, pp. 34, bibl. 55, illus., rouble 1.30.

The depth of dormancy in plants and accordingly their frost resistance can be estimated by reference to the dynamics of the transformation of storage materials, the process of protoplasm separation and detection of plasmodesms, the character of plasmolysis in sucrose solution, the duration of plasmolysis and the resistance of lipoids to temperature effects. Methods of procedure are described and the simple apparatus and reagents needed are listed. Some estimates of frost-resistance in fruit plants established by the method described are tabulated and compared with results of field observations.

3250. Žolkevič, V. N.
Causes of plant losses at low positive temperatures. [Russian.]
Trud. Inst. Fiziol. Rast. Timiryazeva, 1955, **9**: 3-58, bibl. 144.

Literature on low temperature effects is reviewed and some of the main causes of plant injury due to low temperatures propounded by various authors, such as disruption of water balance, increased permeability, reduction in enzyme activity and accumulation of poisonous substances, are listed. In the author's own experiments the physiological effects and biochemical changes in heat-loving and cold-resistant plants transferred from 18–26° C. to 5–7° C. and then back to 20–26° C. were studied and compared. The main test plants were cucumber (heat-loving) and broad bean and sunflower (cold-resistant), but in some experiments tomato, soya bean and marrow were also used.

3251. Lewis, D. A.
Protoplasmic streaming in plants sensitive and insensitive to chilling temperatures.
Science, 1956, **124**: 75-6, bibl. 5.

Plants which are subject to injury when exposed to temperatures below about 10° C. but above their freezing point are referred to as chilling-sensitive plants. In all the chilling-sensitive plants observed (tomato, watermelon, honeydew melon and *Nicotiana glutinosa*) protoplasmic streaming ceased or was just perceptible after 1 or 2 minutes at 10° C., and ceased promptly at 5° or 0° C. Streaming in chilling-insensitive plants (radish and carrot) proceeded at 0° or 2·5° C. In tomato trichomes, increasing the exposure at 0° C. delayed increasingly the resumption of streaming on transfer to 20° C. After 2 days at 0° C. some trichome cells of tomato were plasmolyzed. It is suggested that chilling injury and cessation of streaming may be separate symptoms of some more fundamental disorder induced at low temperatures in chilling-sensitive plants. Alternatively the visible symptoms of chilling injury could be effects secondary to cessation of streaming.—Univ. Calif., Davis.

Physiology and biochemistry.

(*See also* 3308, 3315c-e, h, i, k-m, t, v, y, 3316b, f, o, 3408n, 3430, 4294l.)

3252. Petrovskaja, T. P.
The dormancy of flower buds of trees and shrubs. [Russian.]
Trud. Inst. Fiziol. Rast. Timiryazeva, 1955, **9**: 59-105, bibl. 137, illus.

A review of literature is followed by a detailed description of studies conducted on birch, lime [*Tilia*], lilac and cherry. [For some of the most important results, published separately, see *H.A.*, 25: 31 and 3441.]

3253. Wassink, E. C., and Stolwijk, J. A. J.
Effects of light quality on plant growth.
Annu. Rev. Plant Physiol., 1956, **7**: 373-400, bibl. 87.

The authors chiefly discuss work on angiosperms, covering the effect on formative processes, namely stem elongation, development and shape of leaves, and root growth.

3254. Wareing, P. F.
Photoperiodism in woody plants.
Annu. Rev. Plant Physiol., 1956, **7**: 191-214, bibl. 87.

The effect of photoperiod on dormancy induction, leaf abscission, cambial activity, dormancy breaking and flowering response is discussed. The author considers that the photoperiodic phenomena must be ultimately related to the general problem of dormancy, and this may offer a more direct means of relating photoperiodism to general metabolism than a study of flowering responses. Photoperiodic treatment has an important application in breeding, owing to the possibility of reducing the juvenile stage.

3255. Salisbury, F. B., and Bonner, J.
The reactions of the photoinductive dark period.
Plant Physiol., 1956, **31**: 141-7, bibl. 25.

For inhibiting floral induction in *Xanthium* red light interruptions of the dark period were most effective approximately 8 hours after the beginning of the dark period. The degree of effectiveness before this time depended upon the length of the remaining dark period. A constant amount of red light was required to bring about maximum inhibition of flowering for any given time after the first 2 or 3 hours of darkness. Auxin applied at the start of the dark period may strongly affect the amount of flowering hormone subsequently produced, but it had little effect on critical night length. Applied auxin was most effective in inhibiting floral induction when applied 2 or 3 hours after the beginning of the dark period.—Calif. Inst. Technol., Pasadena.

3256. Liverman, J. L., and Lang, A.
Induction of flowering in long day plants by applied indoleacetic acid.
Plant Physiol., 1956, **31**: 147-50, bibl. 19.

In the long-day species *Hyoscyamus niger* and *Silene armeria* flowering was induced by application of IAA to the leaves of plants grown under threshold conditions.—Calif. Inst. Technol., Pasadena.

3257. Resende, F.
Gradação floral e comportamento das PDLC na transmissão do estado floral entre donor e acceptor (*Bryophyllum* e *Kalanchoë*). **(Floral gradation and behaviour of long-short-day plants in the transmission of the flowering state from donor to acceptor (*Bryophyllum* and *Kalanchoë*).** [English summary pp. 3½.]
Portugal. Acta biol., 1955, **4**: 272-96, bibl. 20, illus.

Grafting experiments indicated that the differences between flowering and vegetative impulses were only quantitative and not qualitative, both coming from the same types of hormone.—Inst. bot., Lisbon.

3258. Pandeya, S. C.
Contributo allo studio della influenza della luna sullo sviluppo delle piante. **(Contribution to the study of the effect of the moon on the development of plants.)** [English summary 9 lines.]
Ann. Fac. Agrar. Perugia, 1954, **10**: 242-7, bibl. 6.

The author briefly reviews the literature on this subject and concludes that in some plants moonlight can keep the stomata open (but not cause them to open), and that if the moon rises before the stomata close its light results in some photosynthesis which promotes photoperiodic induction and advances flowering in long-day plants.

3259. Miller, G. W., and Thorne, D. W.
Effect of bicarbonate ion on the respiration of excised roots.
Plant Physiol., 1956, **31**: 151-5, bibl. 11.

The O_2 uptake of apical sections of Great Northern bean roots was nearly uniform in nutrient solutions with pH between 4·5 and 8·5. At pH 3 and 10·5 there were marked reductions in respiration rate. The respiration of excised bean roots in Hoagland's solution was not appreciably affected by Cl, SO_4, Ca, and Na ions at concentrations of 25 meq./l. Bicarbonate ions markedly inhibited respiration. In plants susceptible to lime-induced chlorosis the rate of O_2 consumption by excised roots was markedly reduced in the presence of bicarbonate ions, but roots from resistant plants were only slightly affected. The inhibition of O_2 uptake by CO in roots in standard Hoagland's solution was largely reversed by light; the extent of reversion was reduced in the presence of bicarbonate ions.—Utah St. agric. Coll., Logan.

3260. Iijima, T.
On the physiology and utilization of vitamin B_1 in garden crops. VI. The effect of thiamin application on the respiration of some horticultural plants. [Japanese with English summary 9 lines.]
J. hort. Ass. Japan, 1956, **25**: 11-16, bibl. 21.

Potato, sweet potato and kidney bean were used as test plants. Respiration of leaves and roots was increased by moderate concentrations of thiamin (1 p.p.m. and 100 p.p.m.). In treated leaves the respiratory quotient was approximately unity. It is suggested that thiamin promotes foliar decomposition of carbohydrates.

3261. Bolli, M.
Esperienze di respirazione e di pressione osmotica nei vegetali sottoposti all'azione dell'acido ascorbico e dell'acido indolacetico. **(Studies on respiration and osmotic pressure in plants supplied with ascorbic acid and indoleacetic acid.)**
Ann. Fac. Agrar. Perugia, 1954, **10**: 248-51, bibl. 6.

In broad bean, parsnip, *Chrysanthemum cinerariaefolium* and some other plants ascorbic acid and, to a lesser extent, indoleacetic acid accelerated respiration. The studies on osmotic pressure were made on field-crop plants.

3262. Sugawara, T.
Studies on the formation of ascorbic acid (vitamin C) in plants. 6. Relationships between formation of ascorbic acid, development of chlorophyll and beginning of photosynthesis.
Jap. J. Bot., 1955, **15**: 10-14, bibl. 17.

From the results of experiments with *Helianthus annuus*, *Zea mays*, *Brassica rapa*, *Vicia faba* and *Avena sativa* it is concluded that the formation of ascorbic acid is closely connected with the initiation of photosynthesis but has no direct connection with the appearance of chlorophyll b.

3263. Schuphan, W.
Über exogene Aminosäuren. **(On exogenous amino-acids.)**
Reprinted from *Kulturpfl.*, Beiheft **1**, 1956, pp. 118-35, bibl. 36.

Beiheft 1 of *Die Kulturpflanze* is a collection of papers, read at Gatersleben, on the biochemistry of cultivated plants. The author here discusses exogenous amino acids in relation to the nutritional value of vegetables and other food plants.

3264. Rubin, B. A. (Editor).
The biochemistry of fruits and vegetables. Symposium 3. [Russian.]
Izd. Akad. Nauk S.S.S.R., 1955, pp. 292, 12r. 20k.

In this collection of 15 papers by various authors the following are of horticultiral interest: "The rôle of oxidising processes in the resistance of cabbage to *Botrytis cinerea*." "Some data on the biochemical characteristics of frost resistance in different varieties of apple." "Characteristics of carbohydrate metabolism in pome and stone fruits." "Biochemical characteristics of perennial onion." "Characteristics of the chemical composition of citrus fruits in the Georgian SSR." "Biochemical characteristics of vegetable varieties raised in different regions of chernozem area." "Quantitative variability in the chemical composition of Mičurin's varieties of fruits, berries and other plants in different geographical regions." "Biochemical characteristics of apple fruits grown in Omsk." "Biochemical characteristics of Omsk forms of cherries and plums." "The intensity of photosynthesis and activity of biochemical processes in potato and cabbage beyond the Arctic Circle."

Growth substances.

(*See also* 3255, 3256, 3315b, g, r, 3316h, 3363-3377, 3408p, 3450, Weeds and weed control section, 3714, 3758, 3797, 3827, 3830, 3834, 3855a, 3868, 3873, 3993, 4033, 4057, 4058, 4062, 4066, 4101, 4138, 4190.)

3265. VAN OVERBEEK, J.
Absorption and translocation of plant regulators.
Annu. Rev. Plant Physiol., 1956, **7**: 355-72, bibl. 125, illus.

The author has collated the isolated facts known on absorption and translocation of plant growth regulators. Leaf-penetrating regulators are translocated through the phloem, while regulators moving out of the root into the aerial parts do so in the xylem. Auxins may move up in the xylem and back down the phloem. Natural auxins display a one-way, apex-to-base transport through parenchyma.

3266. HAY, J. R.
The effect of 2,4-dichlorophenoxyacetic acid and 2,3,5-triiodobenzoic acid on the transport of indoleacetic acid.
Plant Physiol., 1956, **31**: 118-20, bibl. 7.
The effect of 2,4-D and TIBA on an auxin transport mechanism in bean stems.
Proc. 12th annu. Mtg N. centr. Weed Control Conf., 1955, pp. 4-5, from *Weed Abstr.*, **5**, No. 889.

Transport of IAA through excised sections of stems and roots from bean seedlings was studied. Pre-treatment with 2,4-D or TIBA inhibited subsequent translocation of IAA. [Author's summary.]—Harvard Univ., Cambridge, Mass.

3267. KREWSON, C. F., AND OTHERS.
Preliminary screening tests of amino acid derivatives of 2-(2′,4′-dichlorophenoxy) propionic acid.
J. agric. Food Chem., 1956, **4**: 690-3, bibl. 16.

In tests with bean, sunflower, cucumber and cereals, the D-amino acid derivatives of 2,4-DP showed almost complete lack of growth-regulating properties. The L- and DL-amino acid derivatives, however, possessed moderate to high activity and high selectivity. The results of testing for herbicidal properties will be reported elsewhere.

3268. HEATH, O. V. S., AND CLARK, J. E.
Chelating agents as plant growth substances. A possible clue to the mode of action of auxin.
Nature, 1956, **177**: 1118-21, bibl. 6.

In the straight growth test with wheat coleoptile sections the chelating agent ethylenediaminetetra-acetate (EDTA) at a concentration of 10^{-5}M gave practically the same growth increment as did the same concentration of IAA. In further similar experiments with 7 chelating agents of very various molecular structure it was found that all the agents tested significantly increased growth both in the absence and presence of IAA, whereas 2 non-chelating analogues of one of the agents depressed growth. No significant interaction occurred between the chelating agents and IAA. It was concluded that chelating agents act as growth substances by virtue of their chelating properties, and it was postulated that IAA might act in the same way. In experiments on root growth, using intact wheat seedlings, IAA and EDTA used separately again showed essentially similar effects. When the 2 substances were combined, however, a mutual antagonism was evident, the inhibitory effect of a high concentration of either substance being prevented by a low concentration of the other. This indicated that the mode of action of the 2 agents cannot be identical. Ways in which the action of a growth substance may be similar to that of a chelating agent are discussed.

3269. KATO, J.
Effect of gibberellin on elongation, water uptake, and respiration of pea-stem sections.
Science, 1956, **123**: 1132, bibl. 6.

Elongation of and water uptake by pea-stem sections was most markedly increased by gibberellin at pH 7. Gibberellin also increased oxygen uptake.—Kyoto Univ., Japan.

3270. LOCKHART, J. A.
The effect of light and the gibberellins on stem elongation in dwarf and normal pea seedlings.
From abstr. in *Plant Physiol.*, 1956, **31** (Suppl.): xii.

Alaska pea seedlings grown in complete darkness did not respond to a mixture of gibberellic acid and gibberellin A (GA). Seedling transference to red light at the time of treatment resulted in reduced growth. Growth in height of etiolated dwarf pea seedlings was also depressed on exposure to red light: application of GA stimulated growth of both light- and dark-grown plants to the same extent.—Calif. Inst. Tech., Pasadena.

3271. LANG, A.
Bolting and flowering in biennial *Hyoscyamus niger*, induced by gibberellin.
From abstr. in *Plant Physiol.*, 1956, **31** (Suppl.): xxxv.

Application of a mixture of gibberellin A and gibberellic acid caused stem elongation and flowering in plants untreated by cold of a biennial variety of *Hyoscyamus niger*. Bolting was greater in long-day than in short-day conditions. Flower formation was only observed in plants in long days.—Univ. Calif., Los Angeles.

3272. ZIMMERMAN, P. W., AND HITCHCOCK, A. E.
Plant growth-regulating effect of 1,1-difluoroethylene (Genetron 150) applied to plants.
Contr. Boyce Thompson Inst., 1956, **18**: 295-7, bibl. 5, illus.

Genetron 150 possesses physiological activity and has a regulating effect on plant growth similar to that of ethylene gas. Plants tested included tomato, periwinkle, peppermint, tobacco, *Coleus blumei*, orange, *Begonia* sp., Concord grape, privet, geranium, rose and *Nasturtium* sp.

3273. ZUKEL, J. W., AND OTHERS.
Effect of some factors on rate of absorption of maleic hydrazide.
From abstr. in *Plant Physiol.*, 1956, 31 (Suppl.): xxi.

The rate of absorption of maleic hydrazide was directly proportional to the amount of MH remaining on the leaf surface. Absorption by tobacco and snap beans was faster than that by tomatoes. Relative humidity had the greatest effect on absorption rate, the higher the humidity the quicker the absorption rate.—U.S. Rubber Co., Bethany, Conn.

3274. MULLER, W. H., AND MULLER, C. H.
Association patterns involving desert plants that contain toxic products.
Amer. J. Bot., 1956, **43**: 356-61, bibl. 10.

Franseria dumosa, *Thamnosma montana* and *Encelia farinosa* contain water-soluble toxic principles which effectively inhibit the growth of tomato, *Malacothrix*, *Chaenactis* and *Cryptantha* seedlings in water culture. *Malacothrix* and *Chaenactis* are typically shrub-dependent desert annuals; *Cryptantha* is typically shrub-independent. The first two shrubs harbour shrub-dependent herbs, while *Encelia* does not. The production of a toxic material does not constitute any competitive advantage since both types of herbs grow beneath two of these shrubs, and the open-ground annuals occur beneath the third. This is true in spite of the toxicity demonstrated in water culture. It is suggested that the ineffectiveness of the growth inhibitor in the natural habitat may be due to microbial activity, adsorption to soil colloids, or inactivation under xeric conditions. Shrub-dependent herbs grow beneath those desert shrubs which accumulate mounds of wind-blown organic debris. This may be correlated with water-holding capacity of organic colloids. [Authors' summary.]—Santa Barbara Coll., Goleta, Calif.

Radioactivity.

(*See also* 3315f, z, 3408y, 3688.)

3275. LLOYD-JONES, C. P.
Radioactive tracer studies during the period 1953-1955.
A.R. Long Ashton agric. hort. Res. Stat. for 1955, 1956, pp. 116-19, bibl. 7, illus.

In this paper the characteristics of γ-rays, viz. electromagnetic radiations of short wavelength, are outlined and the scintillation counter and autoradiographic technique are described. The advantages of the tracer technique over conventional chemical methods for plant nutrition and protection studies are discussed with examples from Long Ashton work.

3276. NYBOM, N.
Some further experiments on chronic gamma-irradiation of plants.
Reprinted from *Bot. Notiser*, 1956, **109**(1): 1-11, bibl. 12, illus.

The first-generation effects on plants exposed to continuous γ-irradiation are studied. A fractionation of the dosage into 12-hour periods did not markedly change the tolerance of the plants, nor was there any apparent difference between irradiation carried out during the day or during the night. The factors determining the specific tolerance of growing plants towards chronic irradiation are briefly discussed. [Author's summary.]—Balsgård.

Nutrition.

(*See also* 3315n, 3316j, 3460-3475, 3702, 3704, 3706, 3708.)

3277. GRÜTZ, W.
Beziehungen zwischen Nährstoffversorgung und Oxalsäurebildung in der Pflanze. **(The relationship between nutrient supply and oxalic acid formation in plants.)**
Landw. Forschung, 1956, 7(Sonderheft): 121-35, bibl. 57.

In general cations promote oxalic acid formation while anions inhibit it. High P_2O_5 application obstructs oxalic acid formation so that the promoting effect of Ca cannot take effect. Oxalic acid formation was also reduced by N applied as ammonium nitrate. In general disturbances in the nutrient supply result in increased levels of oxalic acid. Test plants included spinach.

3278. LONG, W. G., SWEET, D. V., AND TUKEY, H. B.
Loss of nutrients from plant foliage by leaching as indicated by radioisotopes.
Science, 1956, **123**: 1039-40, bibl. 12.
The loss of nutrients by leaching of the foliage.
Quart. Bull. Mich. agric. Exp. Stat., 1956, **38**: 528-32, bibl. 11.

Young rapidly-growing plants were allowed to absorb labelled P and K through the roots, or labelled P through the bases of cut stems. The plants were then leached under a mist for 4-48 hr. and the leachate was collected and analysed. Bean (*Phaseolus vulgaris*), sweetpotato (*Ipomoea batatas*) and poinsettia (*Euphorbia pulcherrima*) plants lost no significant amounts of root-absorbed P^{32}. Bean cuttings lost 1·5% and rose cuttings lost 12·8% of the labelled phosphate previously absorbed. Ten-day-old bean plants lost 2·2% of the labelled K absorbed from the root medium. In later experiments bean plants absorbed labelled K and Rb from nutrient solutions with 2 salt levels. Leachate analysis showed that plants held in the dark during absorption lost 71% and 42% of K^{42} and 14% and 7% of Rb^{86} at the high and low salt levels respectively. Losses of root-absorbed K^{42} for plants that had been kept in the light were 5% and 12% at high and low salt levels respectively, with loss of 5% of the root-absorbed Rb^{86} at both levels. Chemical plant analysis showed a reduction of 10% in Ca, K, Mg, N and P contents of leached plants. Chromatographic analysis showed that large amounts of galactan were leached from the leaves.—Dep. Hort., Mich. St. Univ., East Lansing.

3279. MORGAN, N. D., AND WICKSTROM, G. A.
Give your plants a blood test.
Bett. Crops, 1956, **40**(5): 6-10, 45-50, illus.

Instructions are given for carrying out rapid tests for deficiencies of N, P and K in the field with expressed sap. Preparation of the reagents and test papers is described in detail. Each test paper is prepared for assessing all three nutrients, discrimination of level being most accurate for K.

3280. WALLACE, A., AND ASHCROFT, R. T.
Correlation of phosphorus and magnesium contents of plants grown in synthetic ion-exchange resins.
Agron. J., 1956, **48**: 219-22, bibl. 5.

Rough lemon, avocado, barley and bush beans were grown in sand cultures containing ion-exchange resins that supplied Mg and P in factorial combinations. In general there was little evidence to indicate that increased Mg resulted in an increased P content in the plants. In avocado, however, which has a low Mg requirement, an increase in P content did occur with increasing Mg levels, but only at a high P level. P had no effect on uptake or distribution of Mg.—Dept. of subtrop. Hort., Univ. Calif., Los Angeles.

3281. Lunt, O. R., and Kwate, B.
Potassium frit as a special-purpose fertilizer.
Soil Sci., 1956, **82**: 3-8, bibl. 11.

Frit 8A of mesh <200, low solubility and high weathering rate, containing 36% of K_2O, was applied with a K-free nutrient solution to tomatoes in sand culture. Recovery of K from the frit was approximately 50–66% in growing periods of 50–60 days and was highest at relatively low application rates. Greenhouse carnations growing in a 2 : 1 mixture of loamy sand and peat were given five different K treatments: (1) nil; (2) K_2SO_4 applied every 3 months; (3) K_2SO_4 monthly; (4) Frit 8A every 6 months; (5) Frit 8A once in the year. The corresponding rates of K_2O supply per 100 sq. ft. per year were 0, 0·8, 2·4, 2·4 and 6·0 lb. Data tabulated for the end of the first 6½ months show soil K, plant K and yield of blooms. Treatment 4 compared favourably with the "ideal" treatment 3. In 5 both plants and soil showed very high K levels. As much as 10 g. of frit per 6-inch pot has safely been used for K supply to chrysanthemum, poinsettia, hydrangea and cyclamen. An ample K supply was maintained for 8 months in a chrysanthemum soil mixture of high permeability using 3 lb. of frit per 100 sq. ft. Chlorosis, induced in sensitive plants by incorporation of large amounts of frit in soils tending to alkalinity, was avoided by making surface applications of not more than 6·0 lb. of K_2O per 100 sq. ft. The use of frit prevents leaching and salinity problems.

3282. Rhoads, W. A., Wallace, A., and Romney, E. M.
A slowly soluble source of micronutrients for plants.
Soil Sci., 1956, **81**: 359-69, bibl. 18.

Several relatively insoluble silicate materials (fritted trace elements) were evaluated as sources of Fe and other micronutrients for beans, lemon cuttings, barley and soyabeans in glasshouse experiments, using different soils. The materials were not a satisfactory source of Fe. Plant uptake of Mn, B and possibly Zn was better than that of Fe. Applications of 33,000 lb./acre resulted in decreased Mn uptake by avocado seedlings. —Univ. Calif., Los Angeles.

3283. Sisler, E. C., Dugger, W. M., Jr., and Gauch, H. G.
The role of boron in the translocation of organic compounds in plants.
Plant Physiol., 1956, **31**: 11-17, bibl. 16, illus.

That boron has a role in the translocation of sugars was verified by these experiments with tomato plants in sand culture. Sugar sprays applied to the tips of boron-deficient plants did not prevent death of the tips, but radio-active sucrose was more rapidly translocated in boron-deficient plants not yet showing morphological symptoms in the presence of 50 p.p.m. of boron than in the absence of added boron. Once morphological symptoms of the deficiency were visible, sucrose uptake and translocation were reduced and applied boron did not aid in the distribution of the applied sugar. After 4 hours of exposure to $C^{14}O_2$ a greater percentage of the photosynthate was translocated in boron-sufficient plants than in those showing boron deficiency symptoms. This was more apparent in the basal than in the apical portions of the plant. [From authors' summary.] —Md agric. Exp. Stat.

3284. Baker, J. E., Gauch, H. G., and Dugger, W. M., Jr.
Effects of boron on the water relations of higher plants.
Plant Physiol., 1956, **31**: 89-94, bibl. 28, illus.

The transpiration rate of B-deficient snap bean plants was found to be much lower than that of normal plants owing to (*a*) higher sugar and colloid concentrations in the leaves, (*b*) a decreased rate of water absorption and (*c*) an abnormal leaf morphology including a high percentage of non-functional stomates. A relatively rapid initial water loss from normal excised leaves of bean and tomato plants gradually levelled off to a linear rate; in B-deficient leaves there was a linear rate from the start. A higher concentration of pectins and possibly pentosans occurs in B-deficient leaves, and this may be a factor in the slower wilting of B-deficient plants.—N.C. St. Coll., Raleigh, Univ. Md, College Park, and Univ. Fla, Gainesville.

3285. Thimann, K. V.
Studies on the growth and inhibition of isolated plant parts. V. The effects of cobalt and other metals.
Amer. J. Bot., 1956, **43**: 241-50, bibl. 22.

Cobalt, given as chloride, increased the elongation of etiolated pea stem sections in auxin (IAA or NAA). Its effect was almost doubled in the presence of sucrose. The curvature of split stem sections of peas was also increased by Co. Nickel had a smaller effect and Mn still less, whereas Fe inhibited both responses at all concentrations tested. Cobalt acted equally well in the presence of Mg and K. Growth promotion by Co was almost completely inhibited by arsenite and dinitrophenol. It is deduced that Co promotes some step in oxidative metabolism which normally makes a source of energy available for growth, and diverts it from other metabolic roles, and that Co and Mn act on growth through different mechanisms.—Harvard Univ., Mass.

3286. Brown, J. C.
Iron chlorosis.
Annu. Rev. Plant Physiol., 1956, **7**: 171-90, bibl. 104.

Current knowledge of iron nutrition and the occurrence of iron chlorosis in plants is discussed. The most urgent problems for investigation appear to be an understanding of the biochemistry in chlorosis-susceptible and non-susceptible plants, a resolution of the complex interactions of causative factors, and the development of more effective means of correcting or controlling chlorosis. The use of organic chelating agents in nutritional studies has opened a wide field for research in controlling and explaining the pathways of mineral metabolism in plants.

3287. KNIGHT, A. H., AND CROOKE, W. M.
Interaction between nickel and calcium in plants.
Nature, 1956, **178**: 220, bibl. 6.

The immersion of the whole root system of young tomato plants in a complete nutrient solution containing toxic quantities of Ni resulted in lower leaf Ca contents than in the absence of Ni. With oats the reverse was the case. When half the root system was in the Ni-toxic solution and half in a complete nutrient solution without Ni leaf Ca content was higher than in the absence of Ni in the case of both tomato and oats. The greater part of the increased Ca content of the leaves was absorbed from the "no-Ni" side of the solution. The results suggest that 2 opposing phenomena may occur simultaneously when Ni is absorbed: (1) the roots are damaged and so the absorption of all major nutrients is reduced, and (2) Ni in the leaves increases the absorption of Ca by the roots. In tomatoes (1) predominates unless not all the root system is exposed to Ni, while in oats (2) predominates. —Macaulay Inst. Soil Res., Aberdeen.

3288. BOWEN, H. J. M., AND DYMOND, J. A.
Strontium and barium in plants and soils.
Proc. roy. Soc. Ser. B, 1955, **144**: 355-68, bibl. 37.

A method of determining Sr and Ba in plants and soil extracts is described. It was found that plants absorbed Sr in preference to Ca from most of the soils examined, but that Ba was taken up much less readily. The contents of Sr, Ca and Ba found in many plants, including vegetables and ornamentals, are tabulated. Certain native English species growing on Sr-rich soils may contain up to 2·6% Sr dry weight. Possible Sr indicator plants are discussed.—Radiobiol. Res. Unit, A.E.R.E., Harwell.

3289. BOWEN, H. J. M., AND DYMOND, J. A.
The uptake of calcium and strontium by plants from soils and nutrient solutions.
J. exp. Bot., 1956, **7**: 264-72, bibl. 23.

Plants have been grown in soils and nutrient solutions containing different Ca/Sr ratios to find out whether there is any biological discrimination between calcium and strontium. When tomato plants are grown in nutrient solutions containing molar Ca/Sr ratios from 2/1 to 4,000/1, the shoots do not distinguish between the elements, but the roots absorb Sr preferentially at low concentrations of this element. Since ion exchange resins show the same phenomenon, though to a less marked extent, this is believed to be a physico-chemical rather than a biological effect. No chemical reagent has been found which can extract Ca and Sr from soils in the same ratio as plants. [From authors' summary.] —Radiobiol. Res. Unit, A.E.R.E., Harwell.

3290. FULLER, W. H., AND FLOCKER, W. J.
The uptake of radiostrontium by certain type crops from calcareous soils.
Tech. Bull. Ariz. agric. Exp. Stat. **130**, 1955, pp. 32, bibl. 23.

Among the crops studied were beans, lettuces, tomatoes, spinach and radish. The uptake of radiostrontium was not related to total Ca or to $CaCo_3$ content of different calcareous soils, but was highly significantly correlated with amounts of exchangeable Ca found in different soils. The amount of radiostrontium absorbed rarely exceeded 4% of the amount added, on any soil; edible parts generally contained more than non-edible parts. Foliar applications were not translocated in measurable amount. The uptake of radiostrontium from contaminated crop residues mixed into the soils was small.

3291. ANDERSON, M. S.
Sewage sludge for soil improvement.
Circ. U.S. Dep. Agric. **972**, 1955, pp. 27, bibl. 41, illus.

Various sludges prepared in the United States have been analysed. The N contents of activated sludges were generally higher than those of digested products. K was always low. Activated sludges are widely used as fertilizers for lawns and golf courses, and digested sludges are used as mulches for plants not requiring acid conditions.

Irrigation.

(*See also* 3315j, o, 3316i, k, m, n, 3320, 3386, 3387, 3422, 3435, 3486, 3709, 4061.)

3292. NOSTI NAVA, J.
New manuring and irrigation methods.
Fruit and Vegetables, being *Suppl. FATIS Rev.*, 1956, pp. 11-13, illus.

It is suggested that an extension is likely of a method whereby in orchards manures are applied each year in successively wider furrows round the perimeter of the tree. Sprinkler irrigation problems have been largely mastered and, coupled with the hitherto somewhat elusive practice of cloud seeding, should eventually be common practice.

3293. MONTGRAIN, C.
Irrigation par aspersion. (**Irrigation by sprinkling.**)
Agriculture, Quebec, 1956, **13**: 53-8, bibl. 5, illus.

A brief account is given of typical apparatus, suitable water sources, problems of topography, empirical determination of requirements of various fruit and vegetable crops and maximal application rates for bare and cropped soils of different texture. Details are given of an installation for a flat area of 330 ft. × 660 ft.

3294. MOLENAAR, A., AND OTHERS.
Factors affecting distribution of water from rotating sprinklers.
Stats Circ. Wash. agric. Exp. Stats **248**, 1954, pp. 18, bibl. 7.

Water distribution patterns and the factors affecting them were studied. Wind was shown to have a pronounced effect on the coefficient of uniformity, but the adverse effects were largely overcome by correct spacing of the sprinklers.

3295. SEIDEL, E., AND VOGEL, G.
Untersuchungen über die Brauchbarkeit der verschiedenen Beregnungsdüsen für die Gewächshaus- und Frühbeetberegnung. (**Studies on the use of different irrigation nozzles for irrigation of glasshouses and frames.**)
Arch. Gartenb., 1955, **3**: 362-72, bibl. 5, illus.

After comparative trials with irrigation nozzles those of Gela-Regenpilz are recommended for greenhouse and frame irrigation. Central irrigation installations were found not to be obstructive and to reduce labour requirements for watering.—Inst. Gartenb., Grossbeeren.

Seeds.

(*See also* 3315k, 3804, 4292.)

3296. Toole, E. H., and others.
Physiology of seed germination.
Annu. Rev. Plant Physiol., 1956, **7**: 299-324, bibl. 183.

In this review the processes involving resumption of development are considered rather than the continuation of growth. Factors affecting germination are discussed, also photoperiodic responses of seeds, and glutathione and ascorbic acid relationships.

3297. Plaut, M., and Heller-Cohen, O.
New methods for testing viability of seeds.
World Crops, 1956, **8**: 311, 319, bibl. 3.

The authors discuss the selenite and tetrazolium techniques for testing seed viability. A new method using a solution of 0·003% resazurin has been developed at Rehovot for testing pea, bean and cucumber seeds. Germination capacity is not destroyed by resazurin at this concentration.—Hebrew Univ., Rehovot, Israel.

3298. Sugawara, T.
Influence of nitrates on the germination of seeds under oxygen supply of various concentrations.
Proc. Crop. Sci. Soc. Japan, 1955, **23**: 295-6, from abstr. in *Rec. Res. Fac. Agric. Univ. Tokyo*, 1954/55 [issued March 1956], No. 5, abstr. No. 2.

Germination of tomato, tobacco, lettuce and radish seeds was accelerated in ordinary air and in air with a reduced O^2 concentration by soaking the seed in 0·02–0·005M potassium nitrate solution.

Glasshouses.

(*See also* 3238, 3295, 4281, 4294e.)

3299. Paneth, D.
Greenhouse cooling gains among growers as experiments result in improved systems.
Flor. Exch., 1956, **126**(20): 11-12.

Systems of greenhouse cooling by air conditioning are being tested in the United States. The two chief methods being tested are the wet fan exhaust system and the high pressure mist or fog system, and these are described. The cost of installation of air conditioning with the wet fan system is 10–15 c. per sq. ft., depending on the degree of automation. Increased production and quality of flower crops has resulted from the use of an air conditioning system.

3300. Morris, L. G.
Some aspects of the control of plant environment.
J. agric. Engng Res., 1956, **1**: 156-66, bibl. 7.

The relative effects of environmental factors on the air temperature in a hypothetical glasshouse have been calculated and are discussed. The effect of ventilation rate on air temperature was greatest at high radiation intensities and when no water film was used over the glass. In glasshouses where high ventilation rates cannot be produced a water film over the glass surface appears to be about as effective as blinds for limiting temperature rise. Temperatures can be reduced at all ventilation rates by cooling the incoming air to its wet bulb temperature, and to a lesser extent by evaporation and transpiration within the glasshouse.

3301. Dorsman, C., and Ravensberg, K.
Brandstofbesparing door het gebruik van plastic. **(Fuel saving by the use of plastic.)**
Jaarb. Proefst. Boomkw. Booskoop 1955, pp. 118-21.

In a glasshouse which was lined with plastic the heat loss during the winter was reduced by 30–40%. The soil temperature was ±2° C. higher than in an unlined house. The air temperature was increased by 4° C. at night and by 2° C. during the day. Grafted rhododendrons "Pink Pearl" and "Purple Splendour" grew better and more quickly than in an unlined glasshouse.

3302. Owen, O.
Nitrogen in commercial glasshouse practice.
J. Sci. Food Agric., 1956, **7**: 301-4, bibl. 9.

The author discusses the place of N fertilization in the nutrition of glasshouse crops. The materials used and their application are considered for (i) the propagating stage, (ii) pre-planting applications to the border, and (iii) top-dressing. The author suggests that a knowledge of N levels may be maintained by periodic analysis.—Pollards Nurseries Ltd., Cheshunt, Herts.

Marketing.

3303. Verlot, J. B.
Packaging.
Fruit and Vegetables, being *Suppl. FATIS Rev.*, 1956, pp. 31-9, illus.
Grellier, P.
Rail transport.
Ibidem, pp. 40-3, illus.

In the first of these articles the author briefly outlines the progress of negotiations to get uniformity in the packing of fruit and vegetables for international trade in Europe, and gives details of a joint report by Swiss and French experts on a trial shipment of dessert apples in February 1956. In the second the author describes the arrangement made by the French National Railways for the fast transport of perishable foodstuffs.

Machinery and equipment.

(*See also* 3315q, w, x, 3316g, 3380, 3477.)

3304. Lecrenier, A., and Linden, R.
Use of plastics in horticulture.
Fruit and Vegetables, being *Suppl. FATIS Rev.*, 1956, pp. 67-9, bibl. 9, illus.

A definition of the meaning of plastics is followed by notes on 4 types, namely viscose (or cellophane), polyethylenes, methyl polymethacrylate and polyvinyl chloride. Their uses for the following purposes are briefly considered: protection against bad weather; soil covers; wrapping and carriage of seeds, cuttings, grafts and layers; transport of nursery plants; preserving fruit; packing for market; modifying soil structure; plant labelling. Different plastics vary greatly in the use to which they can be put.

3305. Warley, T. K.
Non-crumbling soil blocks—on the spot.
Grower, 1956, **46**: 149-53, illus.

A Bavarian method of soil block making which had been tested in England is described. Compost of loam, $\frac{2}{5}$ well-rotted farmyard manure and $\frac{1}{5}$ peat is mixed by a rotary cultivator. The compost is levelled within a 5 ft. sq. frame, and is cut in both directions by running a cutting disc across the bed within a guide comprising 6 slots. Holes in the blocks are made by a multiple dibber. The output of completed blocks was 1,400 per man hour.—Univ. Nott. School of Agric., Sutton Bonington.

3306. Roistacher, C. N., and Baker, K. F.
An inexpensive multipurpose soil steamer.
Phytopathology, 1956, **46**: 329-33, bibl. 3, illus.

The steamer consists of a wooden box that can hold 21 cu. ft. of bulk soil, 16 flats of soil or 150–1,000 empty clay pots. A grid of pipes is so placed that no particle of soil is more than 6 in. from steam sources. With a steam flow rate of about 175 lb./hr. a temperature of 212° F. is reached by moderately moist soil in about 30 min. The unit has been tested for 7 years with completely satisfactory results at the University of California, Los Angeles. Its advantages lie in its rapid and efficient use of steam, its cheap and simple construction, its dependability and few moving parts, and its adaptability for sterilizing various types of container as well as bulk soil. Constructional details are illustrated diagrammatically.—Univ. Calif., Los Angeles.

3307. May, C., and Hacskaylo, E.
New control unit developed for intermittent misting of cuttings.
Amer. Nurserym., 1956, **103**(8): 18, illus.

The action of the unit described depends on alternate evaporation from and absorption of water by a hollow porous clay globe, called a Livingstone atmometer. Its use avoids the problem of electrolysis of wires at the wet contact points. The apparatus has been used with satisfactory results at the Plant Industry Station, Beltsville, Md.

3308. Decker, J. P.
An apparatus for measuring transpiration of intact plants under controlled light, humidity, temperature and wind.
From abstr. in *Plant Physiol.*, 1956, **31** (Suppl.): xvi.

The apparatus is essentially one for measuring photosynthesis, but the infrared gas analyser is sensitized to water vapour instead of to CO_2. An entire intact shoot is enclosed in a constant-temperature, illuminated chamber and the rate of increase in humidity is measured with a gas analyser.—Rocky Mt. Forest and Range exp. Stat., Tempe, Arizona.

3309. King, J. R.
The rapid collection of pollen.
Proc. Amer. Soc. hort. Sci., 1955, **66**: 155-6, illus.

An instrument for the rapid collection of anthers by vacuum suction is described and illustrated. It is cheap, simple in construction and easy to operate. It has been highly successful with all types of flowers tested, but is particularly well adapted to the collection of small anthers (as in deciduous fruit trees and small fruits) and of anthers which are difficult to extract.—La St. Univ., Baton Rouge.

3310. Courshee, R. J.
A pocket calculator for small volume spraying.
J. agric. Engng Res., 1956, **1**: 143-9, bibl. 19.

A nomogram has been derived which enables a prediction to be made of the fineness and density of spray deposits. It is also possible to select the correct nozzles and determine the quantity in gal./acre required to give a desired form of spray. This nomogram is used as a basis for the design of the calculator. [Author's summary.]

3311. Pflug, I. J.
Breather bag for CA fruit-vegetable storages.
Agric. Engng St. Joseph Mich., 1956, **37**: 476-7, bibl. 4.

The breather bag acts to reduce air leakage due to temperature cycling and as a safety device in a gas store. Such a bag properly installed and of appropriate size can reduce leakage from temperature cycles by 50%, but it will not reduce leakage from pressure differentials induced by evaporator fans, wind or changing barometric pressure. The selection and operation of such a bag is outlined. [From author's summary.]

3312. Richards, A. G.
A liquid mold technic for radiographing surfaces of leaves.
Bull. Torrey bot. Club, 1956, **83**: 289-91, illus.

A method has been described which produces molds of external surfaces of leaves in a solution that is relatively opaque to x-ray radiation. These liquid molds are radiographed by using dental x-ray equipment and supplied to record the topography of the surfaces of leaves. [Author's summary.]—School of Dentistry, Univ. Mich., Ann Arbor.

3313. Anon.
The Teles Tiger hedge-cutter.
Park Administ., 1956, **21**: 58, illus.

The tool has a series of high-speed cutter-blades linked together in a continuous chain which is electrically driven around a static guide-bar. It weighs 6 lb.

3314. Wesley, R.
Measuring the height of trees.
Park Administ., 1956, **21**: 80-4, illus.

A description of how to use and deal with three "altimeters", viz. the Blume-Leiss "hypsometer", the Haga altimeter and the Auto-Simplex tree and height measurer. All are obtainable in London.

Noted.

3315.

a ALBERTA HORTICULTURAL ADVISORY COMMITTEE, 1956-1957.
Alberta horticultural guide.
Publ. Alberta agric. Ext. Serv. **92**, 1956, pp. 31, map.
Including recommended varieties of fruits, vegetables, flowers, trees and shrubs.

b AUDUS, L. J., AND THRESH, R.
The effects of synthetic growth-regulator treatments on the levels of free endogenous growth-substances in plants.
Ann. Bot. Lond., 1956, **20**: 439-59, bibl. 42.
Work with peas, beans and sunflowers in the Botany Department, Bedford College, London.

c BENNE, E. J., AND JERRIM, D. M.
Report on molybdenum in plants.
J. Ass. off. agric. Chem. Wash., 1956, **39**: 412-19, bibl. 15.
Mo determination.

d BENNE, E. J., AND BRAMMELL, W. S.
Report on zinc in plants.
J. Ass. off. agric. Chem. Wash., 1956, **39**: 429-33, bibl. 8.
Zn determination.

e BIDDULPH, O., CORY, R., AND BIDDULPH, S.
The absorption and translocation of sulfur in Red Kidney bean.
Plant Physiol., 1956, **31**: 28-33, bibl. 22, illus.

f BOWEN, H. J. M.
The future applications of atomic energy to horticulture.
J. roy. hort. Soc., 1956, **81**: 303-8, illus.
A review of work on the use of radioactive tracers and atomic radiation.

g BRITTON, G., HOUSLEY, S., AND BENTLEY, J. A.
Studies in plant growth hormones. V. Chromatography of hormones in excised and intact roots of tomato seedlings.
J. exp. Bot., 1956, **7**: 239-51, bibl. 24.

h BÜNNING, E.
Endogenous rhythms in plants.
Annu. Rev. Plant Physiol., 1956, **7**: 71-90, bibl. 99.
A review.

i BUSSMANN, A.
Die Magnesiumbestimmung mit Titangelb. **(Magnesium determination with thiazole yellow.)**
Reprinted from *Z. anal. Chem.*, 1956, **148**: 413-27, bibl. 16.

j CHAMBIONNAT, A.
La corrosion des canaux d'irrigation. Étude de la protection par les enduits. Essais d'utilisation de ciments spéciaux. **(The corrosion of irrigation canals. A study of protective coatings. A trial on the use of special cements.)**
Terre maroc., 1956, **30**: 187-9.
None were any good.

k DANIELSON, C. E.
Plant proteins.
Annu. Rev. Plant Physiol., 1956, **7**: 215-36, bibl. 64.
A review, with special reference to seed proteins.

l DOMAN, N. G.
The nature of the products of CO_2 fixation by plant tissues in the dark. [Russian, with English summary 9 lines.]
Biohimija, 1956, **21**: 78-83, bibl. 23, illus.

m DOWNS, R. J., AND BORTHWICK, H. A.
Effects of photoperiod on growth of trees.
Bot. Gaz., 1956, **117**: 310-26, bibl. 29, illus.
Mainly ornamental.

n EPSTEIN, E.
Mineral nutrition of plants: mechanisms of uptake and transport.
Annu. Rev. Plant Physiol., 1956, **7**: 1-24, bibl. 126.
A review.

o FROST, K. R., AND SCHWALEN, H. C.
Estimating sprinkler evaporation losses.
Calif. Citrogr., 1956, **41**: 351.

p GANTT, C. W., JR., AND HULBURT, W. C.
Hose pump for applying nitrogen solutions.
Fmrs Bull. U.S. Dep. Agric. **2096**, 1956, pp. 11, illus.
This pump measures uniformly nitrogen fertilizers in solution at low pressure.

q HACK, H. R. B.
A note on the use of tensiometers.
A.R. Cheshunt exp. Res. Stat. 1953, 1954, pp. 71-6, bibl. 5. [Received 1956.]
Current investigations include comparison of tension-indicating systems and the displacement of water from tensiometers.

r HOUSLEY, S., AND BENTLEY, J. A.
Studies in plant growth hormones. IV. Chromatography of hormones and hormone precursors in cabbage.
J. exp. Bot., 1956, **7**: 219-38, bibl. 19.

s HUDSON, J. P.
Increasing plants from roots.
Gdnrs' Chron., 1956, **139**: 528-9, 654-5, bibl. 5, illus.
Terminology and methods.

t HUNTER, N. W., AND OTHERS.
Effects of light on the rate of respiration in the stem of *Pisum sativum* L.
Plant Physiol., 1956, **31**: 167-9, bibl. 5.

u JESZENSZKY, Á.
A termálvíz és a növényhajtatás. **(Forcing with thermal waters.)**
Kert. Szől., 1954, No. 11, pp. 13-14, from abstr. in *Hung. agric. Rev.*, 1955, **4**(1): 6-7.
The possibility of using thermal waters for glasshouse and frame heating.

v JOHNSTON, F. B.
Isolation of plant starches.
Nature, 1956, **178**: 370.
From green apple, green tomato and other plant materials.

w MAAN, W. J.
De Kolibrie. Een Nederlandse landbouwhelikopter. (**The Kolibrie. A Dutch agricultural helicopter.**) [English summary 8 lines.]
Meded. Dir. Tuinb., 1956, **19**: 272-5, illus.
Promising results have been obtained in trial flights.

x MATHIS, W. T.
Report on the flame photometric determination of potassium and sodium in plant tissue.
J. Ass. off. agric. Chem. Wash., 1956, **39**: 419-23.

y NEYLAND, M., AND THIMANN, K. V.
Organic acid content of *Kalanchoë* leaves on different photoperiods.
From abstr. in *Plant Physiol.*, 1956, **31** (Suppl.): xxxv, xxxvi.

z NIELSEN, G.
Isotopers anvendelse i havebrugsforskningen. (**Uses of isotopes in horticultural research.**)
Horticultura, 1956, **10**: 61-6, 81-4, bibl. 17, illus.

3316.

a PARKER, J.
Drought resistance in woody plants.
Bot. Rev., 1956, **22**: 241-89, bibl. 258.
A review.

b PIENAAR, W. J., LOTZ, E. V.D. S., AND PIAGET, J. E. H.
A few observations in connection with the flame photometric determination of potassium, calcium and sodium in plant material with the aid of the Beckman flame spectrophotometer.
Sci. Bull. Dep. Agric. S. Afr. **362**, 1955, pp. 23, bibl. 1.

c PRICE, J. R.
Some aspects of organic chemical research as applied to agriculture.
J. Aust. Inst. agric. Sci., 1956, **22**: 3-10.
In the search for medicinal crops and the study of root exudate effects.

d SAX, K.
What's new in plant propagation?
Nat. hort. Mag., 1956, **35**: 116-18.
A dip into old literature suggests that the answer is "very little".

e SKELDING, A. D.
Effect of carbon dioxide on the manganese absorption of red beet tissue.
Nature, 1956, **177**: 1038, bibl. 3.
Inhibitory, suggesting that the naturally occurring inhibitor [see *H.A.*, 23: 1462] is a CO_2 fixation product.

f SNOW, M., AND SNOW, R.
Regulation of sizes of leaf primordia by growing-point of stem apex.
Proc. roy. Soc. Ser. B, 1955, **144**: 222-9, bibl. 5, illus.
For earlier work see *H.A.*, 23: 65.

g SPURR, A. R.
Color photography of fluorescent plant materials.
Reprinted from *J. biol. photogr. Ass.*, 1955, **23**: 78-85, bibl. 17, illus.
Apparatus and technique for studying fluorescent conditions associated with physiological disorders in vegetable crops.

h TORREY, J. G.
Physiology of root elongation.
Annu. Rev. Plant Physiol., 1956, **7**: 237-66, bibl. 149.
Recent work on measurement, inhibition, and relations of auxins and auxin antagonisms.

i TURCK, G.
Overhead spray irrigation.
Rhod. agric. J., 1956, **53**: 182-204, illus.
Selection and installation of systems for tobacco, vegetable and other crops.

j WADE, G. C.
The known distribution of trace element deficiencies of plants other than pastures in Tasmania.
J. Aust. Inst. agric. Sci., 1956, **22**: 37-9, bibl. 7.
A summary of the information on Zn, Mn, B, Cu, Fe and Mo deficiencies in Tasmania with one record of Mn toxicity.

k WILCOX, L. V.
Classification and use of irrigation waters.
Circ. U.S. Dep. Agric. **969**, 1955, pp. 19.
Collection, analysis, classification according to Na hazard, use and supplemental irrigation.

l WILNER, J.
Results of laboratory tests for winter hardiness of woody plants by electrolytic methods.
Proc. Amer. Soc. hort. Sci., 1955, **66**: 93-9, bibl. 12.
For abstract of duplicate see *H.A.*, 25: 3551.

m WOODWARD, G. O., AND GILDEN, R. O.
Successful sprinkler irrigation.
Circ. Wyo. agric. Ext. Serv. **141**, 1955, pp. 11, illus.
Advisory notes on design and operation.

n WOODWARD, G. O.
Irrigation water measurement.
Ext. Circ. Wyo. agric. Ext. Serv. **132**, revised 1956, pp. 30.
Handbook of discharge tables.

o ZSCHAECK, H.
Die spektrale Energieverteilung verschiedener Leuchtstoffröhren und deren Messung. (**The distribution of spectral energy of different illumination rays and its measurement.**)
Arch. Gartenb., 1955, **3**: 326-31, bibl. 6.
For application in studies of supplementary lighting in horticulture.

TREE FRUITS, DECIDUOUS.

General.

(*See also* 3235, 3408b, f, o-q, w, 4262, 4271, 4290, 4294a.)

3317. SCHULTZ, E. F., JR., AND SCHNEIDER, G. W.
Sample size necessary to estimate size and quality of fruit, growth of trees, and per cent fruit set of apples and peaches.
Proc. Amer. Soc. hort. Sci., 1955, **66**: 36-44, bibl. 4.

Components of variance affecting size and quality of fruit, growth of trees, and per cent fruit set of apples and peaches are reported. Graphs are presented showing estimates of sample size necessary to attain a precision of ±10% (or multiples of 10%) of the general mean and with 95% confidence. The graphs can also be used in determining optimum sampling schemes and in estimating the practicability of studies of the above characteristics where it is necessary to attempt to measure small differences with a high degree of precision. In general samples larger than 20–30 are not efficient unless the cost of samples relative to the cost of trees is extremely small. [Authors' summary.]—N.C. agric Exp. Stat., Raleigh.

3318. SCHULTZ, E. F., JR.
Optimum allocation of experimental material with an illustrative example in estimating fruit quality.
Proc. Amer. Soc. hort. Sci., 1955, **66**: 421-33, bibl. 10.

If an experiment is one in which the quantitative evaluation of the treatment effects requires the sampling of the experimental units and perhaps the sub-sampling of the samples, then the optimum sampling scheme may be defined as that for which the ratio of total cost per treatment to total information per treatment is a minimum. If C_L and C_S are the respective cost of a larger and a smaller unit (sample and subsample), and σ_L^2 and σ_S^2 are the respective variances of a larger and a smaller unit, the optimum number, n′, of smaller units per larger unit is given by $n' = \sqrt{\frac{C_L}{C_S} \cdot \frac{\sigma_S^2}{\sigma_L^2}}$

The numbers of sampling units and replications required for an optimum sampling scheme can then be found for (i) specified precision, (ii) specified cost or (iii) when costs are not accurately known. An experiment in determining firmness of peaches is used for illustration. G.M.J.

3319. LOCKE, L. F.
Growing fruits and nuts in the Southern Great Plains.
Fmrs' Bull. U.S. Dep. Agric. **2087**, 1955, pp. 28, illus.

Growing apples, crabapples, pears, cherries, peaches, plums, apricots, jujubes, persimmons, grapes, blackberries, dewberries, raspberries, currants, gooseberries, juneberries, strawberries, pecans and black walnuts in Colorado, Kansas, Oklahoma, Texas and New Mexico.

3320. THE COMMERCIAL GROWER.
Fruit survey.
Comm. Gr., 1956, No. 3165, pp. 411-35, illus.

The subjects treated are of particular practical interest to British fruit growers. Some of them have a wider appeal, among them the following: (1) Irrigation of fruit trees in Essex where the average rainfall over the 6 summer months is 10·6 in., whereas the transpiration loss from a grass orchard during the same period averages 18 in. (2) Cane fruits for processing, viz., raspberries, loganberries and blackberries. (3) Aspects of apple plantation management for high quality fruit. (4) Trends and developments in Dutch fruit varieties with separate notes on Close, Stark Earliest, Tydeman's Early Worcester, Taunton Cross, Lobo and Melrose apple varieties. (5) Problems of orchard nutrition. (6) Soft fruit trends in Scotland. (7) The National Fruit Trials, removed some years ago from Wisley, Surrey, to Brogdale in Kent. Some account is given of work in progress.

3321. WILCOX, E. C.
The 1954 fruit tree survey in North Central Washington.
Stats Circ. Wash. agric. Exp. Stats **270**, 1955, pp. 41.

Occasional cold winters occur in north central Washington. This happened in 1949–50, when temperatures fell to −9° F. for 5 days in January and even lower a month later causing considerable damage. The result was replanting and new planting and the 1954 census arose out of a desire to know what had been planted and where since 1949–50. The figures, which are discussed in detail, show that in 1954 as compared with 1949 the number of apple trees had increased by 24%, of pears by 46% and of peaches by 33%, whereas there had been a decrease of 1% in cherry trees, 20% in apricots and 34% in prunes. Relative changes as between varieties and districts are noticeable.

3322. GOOR, A., AND LIBERMAN, J.
The pomegranate. [Hebrew with 2 page English summary.]
Agricultural Publications Section, Ministry of agriculture, Jerusalem, Israel, 1956, pp. 57+2, illus.

This bulletin by the Director of the Department of Horticulture and colleague deals with the history of the pomegranate, its present cultivation in Israel and the varieties suitable. Notes are given on pomegranate production in Spain, Italy, North Africa, Persia and Russia. The pomegranate was the symbol of the Hebrews just as the lotus symbolized Egypt. Its cultivation in Israel can be traced back to 3000 B.C. Nowadays there are some 370 acres under pomegranates in Israel mainly in the Beisan and Harod areas with some in Western Galilee and some in the Negev. In the Beisan Valley they are irrigated with saline water of which they will tolerate 500–1,000 parts per million. In this and in the Jordan areas they receive 4,800–6,000 cubic metres irrigation water per acre per year but considerably less on the coast. They start bearing in their 3rd to 4th year after planting and reach full bearing in the 6th year. Average yield—in which there are great variations according to treatment, soil variety, etc.—is 5–8 tons per acre. They are used mainly as fresh fruits but also for juice production and the better varieties such as the Loufani and the

Wonderful might well find a market in Europe. Notes are given on pests and diseases. Some of the more interesting of the illustrations have not, alas, got English legends.

3323. MANTE, W.
Der Obstbau in der Bauernwirtschaft. (**The place of fruit growing in peasant farming.**)
[*Publ.*] *Inst. Obstb. Berlin*, received 1956, pp. 44, bibl. 39.

The cultivation of fruit trees particularly of apples has an important place in the economy of these small south German farms, which are mostly less than 12 acres in total area.

3324. KETTNER, H.
Die Bestandsdichte als Rentabilitätsfaktor im Obstbau. (**Planting distance as an economic factor in fruit growing.**)
Obstbau, 1956, **75**: 72-3, 74.

Factors affecting planting distances are discussed. The optimal soil coverage per tree crown is 50% in a square and 58% in a triangular planting. Rectangular planting allows mechanization with the least loss of plant cover.—Inst. Obstb. München.

Varieties and breeding.

(*See also* 3315a, 3320, 3408a, c, s-v, z, 3517, 4281, 4288.)

3325. BROOKS, R. M., AND OLMO, H. P.
Register of new fruit and nut varieties. List 10.
Proc. Amer. Soc. hort. Sci., 1955, **66**: 445-54.

List 10 contains brief descriptions of the following new varieties: 1 almond, 8 apples, 4 avocadoes, 1 blackberry, 3 blueberries, 4 cherries, 5 nectarines, 1 olive, 1 orange, 15 peaches, 3 pears, 4 pecans, 1 plum, 3 raspberries, 7 strawberries and 3 walnuts. [The list differs slightly from that noted in *H.A.*, 26: 1393.]

3326. ELLENWOOD, C. W., AND FOWLER, T. E.
Some new apple varieties.
Res. Circ. Ohio agric. Exp. Stat. **34**, 1956, pp. 8.

The total number of varieties under observation is about 200. General notes are given here on the red strains of Delicious, Jonathan, McIntosh, Northern Spy, Rome Beauty, Stayman Winesap and York Imperial. Details are given of the commercial characters of 18 other varieties now under trial.

3327. DAYTON, D. F.
A study of the seedlings from controlled cross-pollinations of certain tetraploid apple varieties.
Diss. Abstr., 1956, **16**: 201-2, being *Publ.* 15198 of 70 pp.

Triploid seed was obtained by crossing pollen from selected diploid seedlings with tetraploid forms of McIntosh, Golden Delicious and Jonathan. Germination of triploid seed was relatively low, totalling 60·2% from McIntosh and 64·4% from Golden Delicious. Most of the aneuploids which occurred were apparently eliminated by the low viability of the seed.—Univ. Ill.

3328. MURAWSKI, H.
Untersuchungen zur Stadienentwicklung an Apfelsämlingen als Grundlage für die Obstzüchtung. (**Studies on the stage of development of apple seedlings as a basis for fruit breeding.**)
Arch. Gartenb., 1955, **3**: 255-73, bibl. 26, illus.

Buds were taken from apple seedlings at different physiological stages of development and worked on M. IX, IV and XI. With buds from juvenile seedlings the leaves on the basal end of the resulting shoots were almost as juvenile as those of the parent plant, but leaves nearer the tip, especially on M. IX, showed a more mature character. Similarly, when buds from 1-year-old seedlings were worked on bearing trees, the resultant shoots retained their juvenile character and did not bear flowers. Mature buds worked on juvenile shoots showed no change in physiological age. When buds from the lower, juvenile part of 4-year-old seedlings were worked on the upper, more mature part, the resultant shoots retained their juvenile character, and when scions from the upper part were grafted on the lower part they retained their mature character. Compared with juvenile shoots, mature shoots bore more hairy leaves with greater vein density and more stomata and had a greater flowering potential. It is considered that the differences in juvenile and mature development probably correspond to differences in growth substance content. Applied to breeding, these observations suggest that the time needed to raise fruiting progeny from a cross can be shortened by allowing the seedlings to reach the mature stage before budding them on to M. IX.—Inst. Acker-u. PflB., Müncheberg.

3329. (DODDS, K. S., AND DOWRICK, G. J.)
Induced mutants in crop improvement.
A.R. John Innes hort. Instn, 1955, 1956, pp. 9-10.

In a study of methods of administering the mutagenic agent P^{32} to apples and pear trees, stem injection proved to be easier and to allow greater P uptake than root absorption. A large amount of the isotope was translocated to the meristematic region.

3330. THIELE, I.
Jungfernfrüchtigkeit bei Kernobst als züchterische Aufgabe. (**Parthenocarpy of pome fruits as a breeding problem.**)
Züchter, 1956, **26**: 241-3, bibl. 7.

Parthenocarpy as a means of overcoming the disadvantage of bad weather during flowering is discussed. Data are given from 3 years' observations on the parthenocarpy percentage of some apple and pear varieties. The average weights of parthenocarpic and normal apples were similar.—Inst. Obstb., Berlin.

3331. JOLEY, L. E.
Series I. Evaluation of foreign fruits and nuts. No. 5. Apricots. Apricot varieties tested at Chico, California.
[*Mimeo*] *Rep. U.S. Plant Introd. Gdn Chico*, 1956, pp. 32, illus.

Descriptions taken from several foreign commercial catalogues are given for each of 16 varieties. Each variety is then evaluated and commented upon with regard to its behaviour at the U.S. Plant Introduction Garden at Chico.

3332. Condit, I. J., and Warner, R. M.
Promising new seedling fig.
Calif. Agric., 1956, **10**(6): 4, 14, illus.

Conadria is a promising variety for both fresh and dried fruit markets. Two crops are produced, and the hybrid seedling shows pronounced vigour of growth and crop production.

3333. Leroy, J. F.
Les mûriers des Andes et de l'Afrique tropicale. (**The mulberries of the Andes and of tropical Africa.**)
J. Agric. trop. Bot. appl., 1955, **2**: 676-9, bibl. 2, illus.

The author presents 2 plates showing characters in the sub-genus *Gomphomorus* J. F. Leroy *Morus insignis* Bur., the sub-genus *Afromorus* A. Chev. *Morus lactea* (Sim) Mildbr. and the sub-genus *Eumorus* J. F. Leroy *Morus celtidifolia* H.B.K., referring the reader also to his previous articles on the subject in *Rev. int. Bot. appl.*, 1949, No. 323-4, pp. 481-96 [*H.A.*, 20: 1125] and *Bull. Mus.*, 1949, 2^e^ ser., 21: 725-32.

3334. Mann, A. J., and Keane, F. W. L.
The Spotlight peach in British Columbia.
Fruit Var. hort. Dig., 1955, **10**: 50.

A short description is given of Spotlight (Veteran × Rochester), which was introduced in 1946 and is now being planted in commercial trials as a possible alternative to Redhaven. It has proved one of the hardiest peaches under trial and produces yellow-fleshed, firm fruit of good eating and canning quality, which matures about a week earlier than Rochester.—Summerland exp. Stat., B.C.

3335. Dermen, H.
Histogenetic factors in color and fuzzless peach sports.
J. Hered., 1956, **47**: 64-76, bibl. 11, illus.

Two peach sports are described. One shows a change in flesh colour from yellow to white, and the other a change from normal hairy skin to smooth skin.—U.S.D.A., Plant Indust. Stat., Beltsville, Md.

Propagation and rootstocks.

(*See also* 3238, 3307, 3315s, 3316d, 4012, 4022, 4270.)

3336. Gurgenidze, M. G.
How to improve the germination of stone fruit seeds. [Russian.]
Sad i Ogorod, 1956, No. 6, pp. 45-6.

Fresh seeds of peach, cherry, plum, smooth-shelled almond and apricot were soaked in water for 3–5 days and older seeds for 8–10 days. Immediately after soaking the seeds were placed in a sheltered place in direct sun where in 15–30 minutes they cracked. Then they were cooled off in the shade and stored till required for sowing. The cracked seeds showed greatly improved germination and had to be stratified for only a short time or not at all. Untreated peach seed sown immediately after extraction in October–November gave 40–50% germination while unstratified cracked seed gave the following results: sown in September 60% germination, October 63%, November 70%, December 99–100%, January 78%, February 45% and March 29%.

3337. Visser, T.
The role of seed coats and temperature in after-ripening, germination and respiration of apple seeds.
Proc. kon. ned. Akad. Wetensch. Ser. C, 1956, **59**: 211-22, bibl. 30.

The author reports on developments in the work of which he gave an account in 1953 [see *H.A.*, 24: 3459]. He summarizes as follows: It appeared that the seed coats are no limiting factor in after-ripening. The respiratory activity at a temperature favourable for after-ripening is not significantly obstructed by the seed coats. Germination at a high temperature, particularly of insufficiently after-ripened seeds, is markedly affected by the seed coats. This is partly due to physical resistance, partly to the delaying effect the integuments have on the resumption of "aerobic" respiration following a change from a low to a high temperature. Inhibitors, if present in the seed coats, play no part in germination and after-ripening, while, if present in the embryos, their role is probably secondary.

3338. Flemion, F.
Effects of temperature, light and nutrients on physiological dwarfing in peach seedlings.
From abstr. in *Plant Physiol.*, 1956, **31** (Suppl.): iii.

Physiological dwarfing in seedling peaches was prevented by chilling the seeds at 5° C. for 2–3 months in a moist medium or the seedlings at 5° C. for 6–8 weeks. Continuous illumination or the use of intermittent light at night was used to break dormancy of apical and lateral buds. There was an indication that an inhibitor preventing normal growth was present in unchilled cotyledons. [See also *H.A.*, 26: 943.]—Boyce Thompson Inst., N. York.

3339. Hussain, I., and Khan, M.-u.-D.
Effect of hormones on rooting of cuttings of some horticultural species.
From abstr. in *Proc. 6th Pakistan Sci. Conf., Karachi, 1954, Part III*, pp. 76-8.

The most important results are given of experiments conducted in 1950 and 1951 on the effect of various growth substances on the rooting of cuttings of 12 deciduous and evergreen fruit and ornamental plants.

3340. Hartmann, H. T., and Hansen, C. J.
Rooting of softwood cuttings of several fruit species under mist.
Proc. Amer. Soc. hort. Sci., 1955, **66**: 157-67, bibl. 13, illus.

Softwood cuttings of Santa Rosa, Brompton, Havens 2B and White Damson plums, Peach Rootstock No. 7, Fay Elberta peach, Golden Delicious apple, Texas almond, Paradox walnut and the Sevillano olive were tested for their rooting ability under mist during a 3-year period. Santa Rosa plum, Peach Rootstock No. 7 and Sevillano olive proved to be relatively easy to root under mist provided attention was given to other factors, such as proper timing in obtaining the cuttings and the use of auxin treatments. The other species tried were relatively difficult to root. Of the treatments employed, the use of auxin was the most important.

It made little difference whether the cuttings were rooted in full sun or in the lath-house. The operation of the mist during the daytime only, rather than continuously, resulted in better rooting and diminished the growth of algae. Methods are described for transferring cuttings from the mist cutting beds to the nursery row without individually potting each rooted cutting. [From authors' summary.]—Univ. Calif., Davis.

3341. Hartmann, H. T., and Whisler, J. E.
Rooting cuttings under mist.
Calif. Agric., 1956, **10**(5): 7, 12, illus.

It is stated that certain varieties of peach, plum, apricot, cherry, pear, grape, olive, lemon and many woody ornamental species have been propagated by cuttings under mist in percentages high enough to make the method a possible commercial one. Recommendations are made with regard to rooting medium, the use of hormones, spray nozzles and their automatic operation. J.R.L.

3342. Zatykó, I.
A gyökérnemes gyümölcsfák. (**Fruit trees on their own roots.**)
Kert. Szől., 1954, No. 11, pp. 7-8, from abstr. in *Hung. agric. Rev.*, 1955, **4**(1): 7.

Under certain conditions fruit trees on their own roots are preferable to those on rootstocks. Apple trees on their own roots were most easily produced by the following method: E.M. IV rootstocks were planted in 15–20 cm. deep furrows and budded as low as possible. Next spring the snag was cut out and when the scions reached a height of 20–25 cm. the furrows were gradually filled in and the shoots were mounded. In the spring of the third year the whips were cut back to encourage branching, the mounds opened before bud burst and the trees ringed, resulting by the end of the season in well formed trees on their own roots. Quinces treated in this way rooted easily, but pears and medlars responded less well and most of the plums, cherries and apricots used in these trials died as a result of ringing. For stone fruits pegging down the whips or young trees proved to be a more suitable method of propagation.

3343. Futh, G.
Erster Bericht über die Selektion von *Malus*-Unterlagen und deren vegetative Vermehrbarkeit. (**First report on the selection of *Malus* rootstocks and their vegetative propagation.**)
Züchter, 1956, **26**: 248-56, bibl. 17, illus.

Seeds of *Malus* species from foreign and German botanical gardens were sown in 1951 in trials to find new apple rootstocks. Selection was started on 1-year-old seedlings for disease resistance, growth and ease of propagation and grafting. The progeny of *Malus micromalus* showed a high degree of scab resistance. Root cuttings taken in January began to sprout and form roots within 3 weeks. Shoots with and without roots were taken from these plants in February; shoots without roots gave more favourable propagation results. Rooting of shoots taken from greenhouse plants in February was better than that of shoots taken in June from plants in the open. Cuttings taken in autumn and stored during winter showed little inclination to root. Callusing of cuttings taken in mid-March was good, and both callusing and rooting of those taken in April was good. In preliminary tests rootstock selections were grafted with Croncels in 1953, and the resultant growth data are tabulated.—Inst. Agrobiol., Univ. Greifswald.

3344. Trusevič, G. V.
Large scale evaluation of apple rootstocks in the Krasnodar region. [Russian.]
Sad i Ogorod, 1956, No. 7, pp. 39-43.

The forest apple from the Northern Caucasus, widely used as a rootstock in southern Russia, was found to be incompatible with many cultivated varieties. In 1950 large scale trials were started with this and some other wild apples and with seedlings of the hardy cultivated varieties Borovinka and Grušovka Reveljska. Results presented from 3 nurseries showed that seedlings of the 2 cultivated varieties produced, in every case, a higher percentage of marketable trees than did the wild apples.

3345. Meurman, O.
Omenapuiden perusrungot. (**Rootstocks for apples.**) [English summary $\frac{1}{3}$ p.]
Reprinted from *Maatalous ja Koetoim.*, 1956, **10**: 58-64, bibl. 15.

In experiments in Finland and certain other countries no marked difference was observed in individual variability between apple trees on seedling rootstocks and those on clonal rootstocks. Moreover, it was found that trees on seedling stocks may start to crop earlier than trees on dwarf clonal stocks if they are pruned according to their natural habit of growth. Malling stocks and French crab seedlings were not found to be hardy enough for Finnish conditions. It is recommended that seedlings of the hardy varieties Antonovka and Sugar-Miron should be used as rootstocks and that the new clonal stocks *Malus robusta* 5 and A_2 should be tested in Finland.—Agric. Res. Centre, Piikkiö.

3346. Campbell, A. I.
Stembuilders for cider trees: nursery trials.
A.R. Long Ashton agric. hort. Res. Stat. for 1955, 1956, pp. 46-50.

On Crab C and Seedling cider rootstocks Crab C was tried as a stem builder in comparison with the most usual one, Bulmer's Norman, and with Morgan Sweet, Sweet Coppin, Tremlett's Bitter and Yarlington Mill. Not only did it produce the greatest number of trees tall enough to be worked at the end of two years, but also the number of trees so worked surviving canker attacks was greatest on Crab C as stem builder: finally it is resistant to apple mildew. A criticism that Crab C is likely to produce shoots from below the top union seemed to be unfounded.

3347. Aoki, N.
Studies on double working of apples. II. Investigations on incompatibility in top-working, and literature review. [Japanese, with English summary $\frac{1}{2}$ p.]
Bull. Fac. Agric. Hirosaki Univ., 1956, No. 1, pp. 10-26, bibl. 51, illus.

The percentage of incompatibility observed in Delicious top-worked on Jonathan was 36·7%, and that in Golden Delicious on Jonathan was 18·5%. Starking Delicious worked on Delicious showed 52% incompatibility.

3348. Möhring, H. K.
Der Einfluss der Unterlagen Süsskirsche (*Prunus avium*) und Weichsel (*Prunus mahaleb*) auf den Ertrag der Schattenmorelle. **(The effect of *Prunus avium* and *P. mahaleb* rootstock on yields of morello cherries.)**
Festschr. 25j. Bestehens Gärtnerlehranst. Friesdorf-Bad Godesberg, 1955, pp. 52-61.

In 11 years' trials morellos on *Prunus avium* had higher yields and individual fruit weights, but tended to more uneven ripening, than trees on *P. mahaleb*. Trees on *P. mahaleb* were more susceptible to twig blight (*Monilia* sp.) than those on *P. avium*.

3349. Taleĭsnik, E. D.
The effect of mentor on the growth and hardiness of cherry hybrids. [Russian.]
Trud. Inst. Fiziol. Rast. Timiryazeva, 1955, **9**: 153-202, bibl. 66, illus.

A study of biochemical, physiological and morphological changes occurring in cherry hybrids grafted on old species and varieties of the genus *Cerasus*. Hardy rootstocks improved the frost resistance of the hybrids.

3350. de Bijl, D.
Ervaringen met peren op kwee-onderstammen. **(Experience with pears on quince rootstocks.)**
Fruitteelt, 1956, **46**: 664-6, illus.

Five pear varieties were grown on Quince A, Quince C, or Quince A with an intermediate of Beurré Hardy. Trees on quince A plus intermediate gave the highest average yield except for Conference, which was best on quince A alone. Low yield, poor growth and weak anchorage resulted from the use of quince C.

3351. Lundstad, A.
Forsøk med lagring av epletre. **(Trials on the storage of apple trees.)** [English summary ¾ p.]
Meld. Norg. LandbrHøgsk., 1955-56, **35**: 109-19, bibl. 4.

In many winters frost or snow causes severe damage to saleable fruit trees in Norwegian nurseries. During the winter months of 1952-53 and 1953-54 tests were carried out with young apple trees of 4 varieties to compare cellar storage with overwintering in the nursery. Storage of trees dug in the autumn proved very satisfactory, provided the roots were well covered with sphagnum moss. A drop of the temperature in the cellar to −2° C. for 3 weeks did not injure the trees and a relative humidity of 95–100% did not result in damage by rot fungi. The installation of electric fans in the cellars is recommended in order to bring down the temperature in the autumn by taking in the cold night air from outside.

Pollination.

(*See also* 3309.)

3352. Fleckinger, J.
La pollinisation des arbres fruitiers en rapport avec la production. **(The relation of pollination to fruit production.)**
Reprinted from *Journ. fruit. maraîch. d'Avignon*, March, 1955, pp. 10.

A useful resumé by the Director of Research, Station Centrale de Génétique et d'Amélioration des Plantes, Versailles, of work done in Europe and the U.S.A. with special reference to cross-pollination in apple and pear orchards and the necessity for ensuring it by the use of appropriate varieties. The lists of cross pollinators for Williams and Doyenné du Comice pears and for various other well known pear and apple varieties in different lands should prove widely useful.

3353. Manzo, P.
Contributo allo studio sull'autocompatibilità e sulla partenocarpia di alcune cultivar di pero. **(Contribution to the study of autocompatibility and parthenocarpy of some varieties of pear.)**
Riv. Ortoflorofruttic. ital., 1956, **40**: 166-71, bibl. 5, illus.

Experiments involving 23 new and 9 recently developed pear varieties showed a high proportion of self-sterility. The 3 self-fertile varieties and 20 of the 29 self-sterile varieties were parthenocarpic. A case of probable apogamy occurred in the triploid variety Beurré d'Amanlis.

3354. Porlingh, I. X.
Pollen germination studies in fruit trees. [Greek, with English summary 1½ pp.]
Ph.D. Thesis of the Univ. Thessaloniki, Coll. Agric., Lab. Hort., 1956, pp. 32, bibl. 27, illus.

In pollen tests with 25 varieties of almond, cherry, plum, apple and pear the germination percentage in a sucrose-agar medium was more than 80, except for cherries and triploid apples and pears. Morphological and germination data indicated that the pear varieties Kondoula and Apostoliatika Volou and the apples Fyriki and Karlat were diploids and that the pear Bey Armout was triploid. The pollen germination percentage of the cherry Traghana Volou was increased by the addition of agar and B to the sucrose medium. Comparison of the tetrazolium chloride (T.T.C.) test with the sucrose-agar test showed that the former did not give a sufficiently accurate estimate of the germination percentage. Pollen germination after 8 months' storage under dry and cold (1–3° C.) conditions was markedly reduced, while the staining capacity was unchanged. Stored pollen of apple, pear and plum was stained with acetocarmine or T.T.C. and germinated on the sucrose-agar medium. The 2 staining methods gave similar results. It is concluded that the T.T.C. reaction may be considered as an index of pollen viability rather than as a reliable index of pollen germinability.

Growth phenomena.

(*See also* 3408r.)

3355. Baldini, E., and Mosse, B.
Observations on the origin and development of sphaeroblasts in the apple.
J. hort. Sci., 1956, **31**: 156-62, bibl. 9, illus.

The origin and development of sphaeroblasts and of sphaeroblast shoots arising on disbudded stems of Crab C apple are described. Some measurements were made of anatomical changes induced by the disbudding treatment, and the bearing of these observations on the growth processes of the apple, and their possible significance in relation to the improved rooting of stems, are discussed. [Authors' summary.)—E. Malling Res. Stat., Kent.

3356. Lenné, E.
Ergebnis von Untersuchungen über den Zusammenhang zwischen Erdbodentemperatur und Frühlingsanfang (Apfelblüte). **(Results from studies on the relationship between soil temperature and the start of apple flowering.)**
Festschr. 25j. Bestehens Gärtnerlehranst. Friesdorf-Bad Godesberg, 1955, pp. 102-4.

In 3 groups of studies a marked but irregularly occurring relationship has been observed between soil temperature and phenological phenomena in apple.

Pruning and training.

3357. Hilkenbäumer, F.
Zur Frage der künstlichen Fruchtbogenbildung. **(Arching fruit trees.)**
Reprinted from *Prakt. Ratg. Obstb.*, 1956, No. 1, pp. 1-4, illus.

The Italian method of arching fruit trees was tested in the Rhineland with young apple trees on vigorous stocks. Shoots were bent down to form an arc or were bent horizontally. Fruit bud formation was hindered on arcs as a result of the overcrowding of the crown. Yields of several varieties were increased by bending the shoots horizontally.

3358. Ginai, M. A.
Thinning out *versus* heading back.
Pakistan J. Sci., 1956, **8**(1): 21-34, bibl. 6, illus.

A comparison was made at the Fruit Experiment Station, Quetta, of the effects of heading back, thinning out and combined treatment on peach, almond, apricot, plums, cherry and apple. Figures are given for trunk circumference, wood removed in pruning and fruit yield in Santa Rosa plums. It is concluded that heading back suits those fruit trees which bear their crop on one-year-old wood and laterals, e.g., peaches, almonds, apricots and Japanese plums, while thinning out is beneficial to plants which bear most of their crop on old wood and on terminal inflorescences, e.g., apples, pears, sweet cherries and European type plums.

3359. Anon.
Belgisch haagsysteem. **(The Belgian hedge system.)**
Fruitteelt, 1956, **46**: 464-6, illus.

In this system apples and pears are grown on weak rootstocks and trained to wires according to various methods. Pruning is less severe than in more intensive systems.

3360. Kers, D., Hzn.
Plantsysteem en rendabiliteit in de fruitteelt. Een vergelijking van het blijf/wijksysteem en het spillensysteem. **(Planting system and profits in fruit growing. A comparison of the permanent and filler system with the spindle bush system.)** [English summary $\frac{1}{3}$ p.]
Meded. Dir. Tuinb., 1956, **19**: 279-82, illus.

The capital outlay for a spindle bush plantation was about 33% higher than for a permanent/filler plantation. After 6 years a profit was obtained from the spindle bush plantation, but yields from the permanent/filler plantation did not cover the capital outlay. Glorie van Holland gave the highest yields of the varieties used, but Golden Delicious gave the highest gross financial returns.

3361. Harris, W. B.
Progress report on peach pruning trials.
J. Dep. Agric. S. Aust., 1956, **59**: 359-61.

Trees of freestone and cling peach varieties are being pruned hard or lightly or left unpruned. Hard pruning has reduced yields in the 5-year-old trees. Fruit size has not been seriously affected by light pruning up to the third crop.

3362. Fogle, H. W.
Girdling sweet cherry seedlings for early fruit production.
Fruit Var. hort. Dig., 1955, **10**: 55-6, illus.

The removal in May of a ring of bark, $\frac{3}{16}$-in. wide, from the branches of 3-year-old sweet cherry seedlings proved an effective way of making the trees fruit freely in their fourth year, and thus facilitated the early evaluation of seedlings in a breeding programme. Bending branches was a less effective method of inducing fruiting.—Wash. St. agric. Exp. Stats., Prosser.

Spraying for cultural purposes.

3363. Abbott, D. L.
Growth substances as fruit-thinning agents for apples: progress report.
A.R. Long Ashton agric. hort. Res. Stat. for 1955, 1956, pp. 58-60, bibl. 1.

Naphthaleneacetamide in aqueous spray at concentrations of 25, 50 and 75 p.p.m. 7 days after petal fall had no effect on number or size of fruits in Laxton's Superb. On the other hand applied to Crawley Beauty they all thinned the fruit and increased the size of fruits, and at 25 p.p.m. effected an increase in the marketable crop.

3364. Eggert, F. P.
Hormone thinning of apples gains approval.
Me Fm Res., 1956, **4**(1): 11-12.

Thinning of biennial bearing varieties of apple (Baldwin, Northern Spy and Early McIntosh) and those which do not normally attain sufficient size (Golden Delicious and Red Delicious) with naphthaleneacetic acid and naphthaleneacetamide is recommended. Four years' trials in Maine have shown that spray or dust applications may be made any time within a period of 3 weeks from petal fall. Good judgement is necessary in a year with a light crop. The author found a relationship between the amount of fruit set and the number of seeds per fruit. J.R.L.

3365. Alderman, D.
Alpha-naphthylacetamide: a chemical fruit thinner.
Proc. Amer. Soc. hort. Sci., 1955, **66**: 57-64, bibl. 2.

Naphthylacetamide was tested as a fruit thinning agent on 5 varieties of apple, at 4 concentrations and on

4 dates. There were great varietal differences in response. Concentrations of 50 and 75 p.p.m. were significantly more effective than 25 p.p.m. The earliest application, 6 days after full bloom, gave the best results. Factors affecting response are discussed.—W. Va Univ., Morgantown.

3366. BÖMEKE, H.
Welche Apfelsorten lassen sich chemisch ausdünnen? **(Which apple varieties may be chemically thinned?)**
Mitt. ObstbVersuchsringes Jork, 1956, **11**: 99-103.

Conditions governing the success of hormone thinning of apples are discussed. A table listing the important German varieties and their susceptibility to hormone sprays is given.

3367. KASAHARA, J., AND OGURO, E.
Studies on fruit (blossom) thinning of apples by hormone sprays. II. Thinning effects on Jonathan and Delicious group varieties.
[Japanese with English summary $\frac{1}{3}$ p.]
J. hort. Ass. Japan, 1956, **25**: 54-8, bibl. 5.

Optimal concentrations of NAA were (1) 10 p.p.m. for Jonathan, Delicious, Starking and Richared; (2) 20 p.p.m. for Golden Delicious, but further experiments are necessary for this variety. The best stage for spraying was confirmed as 1–2 weeks after full bloom. Leaves recovered from their epinastic response to spraying in about a week. Application to leaves only was as effective as that to leaves and fruits, indicating that when NAA is absorbed through the leaves the effect is transmitted to the fruit. Results with the first four varieties were promising, but supplementary hand thinning was necessary. [For part I see *H.A.*, 26: 2475.]

3368. COMITÉ NATIONAL POUR L'ÉTUDE DE LA CULTURE FRUITIÈRE.
L'éclaircissage du pommier en culture fruitière. **(Apple thinning in fruit growing.)**
Fruit belge, 1956, **24**: 76-8.

Sprays of 0·2% DNOC applied to Laxton Superb at full bloom prevented biennial bearing; the controls, hand thinned in the first half of June, did not flower in the following year. Hand thinning was more successful with Cox which is less biennial; improvements in size and yields were more marked when thinning was done before 20 June. Thinning by the application of colouring matters gave variable results. Hormone thinning was carried out with a solution of NAA in alcohol, preferably applied 10 days after petal fall. Concentrations varied between 20 and 40 p.p.m., depending on variety and climatic conditions.

3369. KELLEY, V. W.
Effect of naphthaleneacetic acid on the transpiration of Jonathan apple shoots.
Proc. Amer. Soc. hort. Sci., 1955, **66**: 65-6, bibl. 5.

Transpiration of apple and peach shoots was measured by the potometer method to determine the cause of flagging of the foliage following application of NAA thinning sprays. Dipping the shoots in 30 p.p.m. NAA increased transpiration rate by 22–28% in apples and 17% in peaches. The results indicate that flagging is the result of increased water loss rather than a direct effect of the spray on the petiole causing the leaf to droop.—Univ. Ill., Urbana.

3370. KELLEY, V. W.
Effect of certain thinning materials on number of fruit buds formed in Elberta and Halehaven peaches.
Proc. Amer. Soc. hort. Sci., 1955, **66**: 67-9, bibl. 2.

Applications of naphthaleneacetic acid, naphthylacetamide and 3-chloro-isopropyl-N-phenyl carbamate, when applied at various dates from shuck-off to 4 weeks later, all resulted in fewer fruit buds being formed on both varieties, even though little or no thinning occurred. The greatest reduction in fruit bud formation occurred in plots sprayed 4 weeks after shuck-off. When NAA was used at concentrations and times recommended for commercial thinning, however, the reduction was not great enough to affect the following year's crop.—Univ. Ill., Urbana.

3371. KELLEY, V. W.
Time of application of naphthaleneacetic acid for fruit thinning of the peach in relation to the June drop.
Proc. Amer. Soc. hort. Sci., 1955, **66**: 70-2, bibl. 6.

NAA was applied at 30 or 40 p.p.m. to Elberta and Halehaven peaches at various dates from the shuck-off stage to 4 weeks later in 1952 and 1953. The early and late sprays had no thinning effect. The spray applied 2 weeks after shuck-off caused a significant increase in June drop of Elberta, but with Halehaven the increase in drop was not significant [see also *H.A.*, 24: 176]. When this application was made following a rainy period, overthinning occurred in Elberta and some of the succulent terminals were killed. It is concluded that thinning will not occur when application is made too early to affect June drop or when June drop is under way or completed.—Univ. Ill., Urbana.

3372. HARRIS, R. W., AND HANSEN, C. J.
The effects of 2,4,5-trichlorophenoxyacetic acid on the development and maturation of the French prune.
Proc. Amer. Soc. hort. Sci., 1955, **66**: 73-8, bibl. 6.

Spray applications of 25 and 50 p.p.m. of the triethylamine salt of 2,4,5-T to large limbs of mature French prune trees shortly before and after the beginning of pit hardening significantly increased the weight of the fruit. Maximum increases of 16–22% were obtained with the higher concentration. Fruit weight was decreased by concentrations of 25–100 p.p.m. applied 35–63 days after the beginning of pit hardening. None of the sprays hastened maturity by more than 3 days and all caused uneven ripening. Spraying during pit hardening caused some fruit injury and shoot dieback, but spraying after pit hardening caused no damage.—Univ. Calif., Davis. [For later work see *H.A.*, 26: 2483.]

3373. HARRIS, R. W., AND HANSEN, C. J.
The effect of growth regulators on the drop of French prunes.
Proc. Amer. Soc. hort. Sci., 1955, **66**: 79-83, bibl. 5.

Trials on French prune trees over a period of 3 years showed that sprays of 2,4,5-T (15–40 p.p.m.) applied 9–11 weeks after the beginning of pit hardening can reduce fruit drop by about 50%. Such a reduction is not considered sufficient to justify the use of the spray except where mechanical harvesting equipment is used. No injury was observed when 15–40 p.p.m. 2,4,5-T were used between 16 June and 17 July, but the higher concentrations reduced fruit size somewhat.—Univ. Calif., Davis.

3374. Degman, E. S., and Batjer, L. P.
Delayed effects of 2,4,5-trichlorophenoxypropionic acid sprays on Anjou pears.
Proc. Amer. Soc. hort. Sci., 1955, **66**: 84-6, bibl. 3.

Earlier work had shown that sprays of 2,4,5-TP at 25 and 75 p.p.m. applied to Anjou pears at pink stage caused a drastic reduction in fruit set [*H.A.*, 22: 2195]. In experiments with lower concentrations applied at the same stage of development, sprays of 5 and 10 p.p.m. did not significantly affect fruit set in 6 out of 7 orchards, while in 1 orchard a significant increase in fruit set was obtained. When 2,4,5-TP was used as a pre-harvest drop spray at 7·5 and 15 p.p.m. on 25 August or 8 September significant increases in fruit set the following year were obtained in all treatments except the higher concentration applied at the later date. Higher yields were associated with increased fruit set, and fruit size was not affected. With the earlier treatment some terminal buds showed minor injury. Most treatments resulted in a reduced number of shoots but greater length per shoot.—St. Coll. Wash., and U.S. Dep. Agric., Wenatchee, Wash.

3375. Lott, R. V., and Rice, R. R.
Effect of preharvest sprays of 2,4,5-trichlorophenoxypropionic acid upon the maturation of fruits of important summer-maturing apple varieties.
Bull. Ill. agric. Exp. Stat. **588**, 1955, pp. 31, bibl. 27.

A 2,4,5-TP formulation was applied in July to Transparent, Giant Transparent, Lodi and Red Duchess apple trees at 20 p.p.m. Four groups of Wealthy were sprayed with different concentrations at different times. Fruit drop by all varieties was inhibited by the treatment, but all showed some form of abnormal ripening. Treated fruits of Red Duchess and Wealthy developed more red colour earlier than did control fruits, but their texture was abnormally soft.

3376. Lott, R. V., and Rice, R. R.
Effect of preharvest sprays of 2,4,5-trichlorophenoxypropionic acid upon the maturation of Jonathan, Starking, and Golden Delicious apples.
Bull. Ill. agric. Exp. Stat. **589**, 1955, pp. 29, bibl. 28.

Sprays of a 2,4,5-TP formulation applied in September effectively inhibited fruit drop from 14-year-old trees of Jonathan, Starking and Golden Delicious. No measurable increase in amount or intensity of red skin colour was observed in Jonathan or Starking. Treated fruits of Golden Delicious developed a darker yellow colour than normal, and had less flavour; they became less firm and crisp than the controls as they approached maturity, and in the mature fruit cracking occurred. Concentrations of acids, sugars and dry matter were not significantly affected by 2,4,5-TP treatment, except in mature and post-mature Delicious fruits. As a result of the treatment the quality of mature and post-mature fruits was lower than normal. [See also *H.A.*, 26: 1440.]

3377. Crane, J. C.
Prospective uses of plant growth regulators in fig culture.
Proc. 10th annu. Res. Conf. Calif. Fig Inst., 1956, pp. 5-6.

Applications of maleic hydrazide to Calimyrna fig trees at concentrations of 500 and 1,000 p.p.m. inhibited terminal shoot growth with the result that lateral branching of the current season's growth took place freely with some branching on the one-year-old wood. Tests with the triethylamine salt of 2,4,5-trichlorophenoxyacetic acid at 50 and 100 p.p.m. showed that it was an effective material for controlling suckers. No harm was done to the trees. J.R.L.

Nutrition and soil management.

(*See also* 3292, 3293.)

3378. Ritter, C. M.
Initial report on nutritional studies with the Elberta peach.
St. hort. Ass. Pa News, 1956, **35**: 67-76.

The largest fruit crop during the first year of commercial production was produced from trees receiving ¼ lb. N per year of the tree's age, ½–1 lb. annually of 60% muriate of potash, and 5 lb. annually of 20% superphosphate. Nitrogen fertilizer treatments more than doubled the average yield, and also gave greater fresh and dry leaf weights, larger leaf area and greater trunk diameter than in control trees. The percentages of leaf N and Mn were increased by increased N fertilization. A significant seasonal reduction in leaf P and K was caused by applications of 4 times the normal amount of N.

3379. Rogers B. L., Batjer, L. P., and Billingsley, H. D.
Fertilizer applications as related to nitrogen, phosphorus, potassium, calcium, and magnesium utilization by peach trees.
Proc. Amer. Soc. hort. Sci., 1955, **66**: 7-12, bibl. 3.

The utilization of nutrients by Alberta peach trees was studied in plots fertilized for a 10-year period with either N alone or NPK. The contents of N, P, K, Ca and Mg were determined in leaves, top bark, top wood, root bark, root wood and fruit. The addition of P and K fertilizer did not significantly increase the uptake of any of the elements except K, which was higher in the root wood of the NPK plots than in the N plots. Nutrients moved out of wood and bark of the top portions of the trees as the tissues became older. N and P moved out of root bark, and N out of root wood, as the tissues became older, but there were significant increases in Ca in the root bark and of K in the root wood. Translocation of nutrients in the roots was slight compared with changes in the tops. N and P concentrations in leaves were lower and Ca, Mg, and K concentrations higher at leaf-fall than in mid-summer. The estimated amounts of the various elements utilized yearly by a mature peach tree are tabulated.—U.S. Dep. Agric., Wenatchee, Wash. [For similar work on apples see *H.A.*, 23: 2603.]

3380. Kaindl. K., and Frohner, W.
Versuche über die Wirksamkeit von Lanzendüngung und Oberflächendüngung mit Hilfe von P^{32}. **(The comparative effects of manuring with fertilizer lance and broadcasting.)**
Mitt. Klosterneuburg Ser. B, 1956, **6**: 107-15.

Experiments with tagged fertilizers applied by lance and broadcast on 6 apricot trees [2 lance treated, 2 broadcast and 2 control trees] showed that the lance treatment was about 3 times as effective in providing nutrients absorbed by the roots as broadcasting.

3381. Dániel, L.
Új irányok a gyümölcsök tápanyagutánpótlásában. **(New lines in fruit tree nutrition.)**
Kert. Szől., 1954, No. 12, pp. 11-12, from abstr. in *Hung. agric. Rev.*, 1955, **4**(1): 7.

Recent experiments have shown that fertilizer application to a depth of 40–50 cm. is more effective than that to a depth of 12–15 cm. In mature orchards the nutrients should be placed in trenches cut in the middle of the alleys, whereas in young orchards the trenches should be placed close to the tree rows. Suggested rates of application are 20–30 g. N, 5–10 g. P, 20–30 g. K and 1·8 kg. organic manure per sq. m. Cover cropping of orchards is also considered, for which purpose suitable grass species are recommended.

3382. Stanković, D., and Bećarević, A.
Some factors affecting the absorption of phosphorus by the roots and leaves of fruit trees as determined by P^{32}. [Serbian, with English summary ½ p.]
Rev. Res. Work Fac. Agric. Belgrade, 1955, **3**(2): 49-60, bibl. 3.

P in mineral form was translocated simultaneously through the xylem and phloem of fruit trees. A low rate (0·01%) of B stimulated P uptake by the roots, but a higher rate (1%) in some cases damaged the tissues and retarded P uptake. The wetting agent "Tagger" at 0·1 and 0·2% added to foliar sprays increased P absorption by the leaves; B at 0·2% had hardly any effect. P was absorbed at about the same rate by the upper and lower sides of the leaves and by shaded and unshaded leaves. More of the nutrient accumulated in young than in mature leaves. X-ray irradiation (500 r) increased P translocation in young shoots.

3383. Pouwer, A.
De invloed van de regenval op de kaliopname van vruchtbomen. **(The effect of rainfall on potassium uptake of fruit trees.)** [English summary ¼ p.]
Meded. Dir. Tuinb., 1956, **19**: 291-7, bibl. 9.

In 2 seasons' observations K levels in apple leaves were related to rainfall in April and May, adequate rainfall at this time leading to high K levels. In grass orchards on river clay soil applications of potassium were largely retained in the top (0–5 cm.) level of soil.

3384. Walker, D. R., and Fisher, E. G.
Foliar sprays of urea on sour cherry trees.
Proc. Amer. Soc. hort. Sci., 1955, **66**: 21-7, bibl. 15, illus.

Urea foliage sprays applied to commercial orchards of sour cherries had no statistically significant effect but tended to increase terminal growth and fruit size and to decrease percentage of fruit soluble solids. Complete fertilizer sprays were of little value. The urea sprays caused severe leaf injury and defoliation on Montmorency trees but did not injure Morellos. The injury was shown to be related to the concentration of biuret impurity in the urea, crystal urea sprays being harmless.—Cornell Univ., Ithaca, N.Y. [See also *H.A.*, 25: 2477.]

3385. Oland, K., and Yemm, E. W.
Nitrogenous reserves of apple trees.
Nature, 1956, **178**: 219, bibl. 4.

Apple stem tissue extractions have shown that arginine and asparagine are the chief nitrogenous reserves, representing together 70–80% of the total soluble nitrogen which could be extracted. Some problems of extraction are discussed. A full account of the investigation is to be published elsewhere.—Agric. Coll. Norway, Vollebekk, and Univ. Bristol.

3386. Gorin, T. I.
A combined method of orchard irrigation. [Russian.]
Sad i Ogorod, 1956, No. 7, pp. 35-7, illus.

Data are given showing that neither basin nor furrow irrigations alone provide the whole root-inhabiting layer of soil with adequate moisture. A combination of both methods, however, ensured an evenly distributed high moisture content of the soil, i.e. 53·4–81·7% of field capacity, throughout the growing season and increased the yields of apples by 24·7% and of cherries by 20·4% above those obtained by furrow irrigation alone.

3387. Butijn, J., and van't Leven, J. A.
Een beregeningsproef in de fruitteelt op zeeklei. **(A sprinkler irrigation experiment in orchards on sea clay.)** [English summary ½ p.]
Meded. Dir. Tuinb., 1956, **19**: 356-68, bibl. 11, illus.

Sprinkler irrigation of apple trees on a shallow soil had no effect in 2 seasons, but in the third, dry year of 1955 yields of Cox on M. II were increased by almost 50% and yields of Jonathan on a seedling rootstock by 20%. On the unirrigated plots there was little growth during August 1955, both varieties wilted and Cox showed heavy leaf fall, whereas the irrigated trees showed a steady growth increase throughout the season. The fruit of irrigated Cox showed less cracking and bitter pit.

3388. Wishart, R. L.
Soil management in non-irrigated orchards and vineyards.
J. Dep. Agric. S. Aust., 1956, **59**: 304-13, 315, 362-7, bibl. 4, illus.

This comprehensive, well illustrated article should be of great value to those suffering from decreasing returns from their fruit trees or, particularly, vines resulting from increased soil impoverishment. Briefly the author's argued, advisory conclusions are as follows: Aim at increasing soil organic matter by cover cropping, in particular, and appropriate manuring. For cover cropping subterranean clover and the medics (*Medicago* *denticulata* and *M. tribuloides*) are specially recommended. Their growth should be encouraged by appropriate described methods. Next, maximum utilization of rainfall should be aimed at and the maintenance of soil structure by leaving soil as rough as possible: cultivate only to kill weeds, restrain speed of cultivation implements, don't cultivate when soil is too wet or too dry, make any new plantings "on the contour". When cultivating consider the water and nitrogen requirements of trees or vines at the time. For obviating frost damage, cultivate early, leave ground smooth or roll it and then leave undisturbed till the frost danger is passed. Subsoil, if necessary to break pan, before planting, but beware of subsoiling, which may do great damage to roots, in established vines or orchards. The reasons for this advice are set out cogently and clearly.

3389. Simons, R. K.
Effects of different orchard management practices upon availability of soil moisture.
Proc. Amer. Soc. hort. Sci., 1955, **66**: 1-6, bibl. 9.
Orchard management practices for conservation of soil moisture.
Trans. Ill. St. hort. Soc. 1955, 1956, pp. 182-90, bibl. 8.

A young apple orchard in sod or silt loam was given 4 treatments during 1952–54, namely mowed only, unmowed, mowed and culticut, and culticut only. Culticutting maintained a semi-trashy system of cultivation, the soil surface being slightly broken. There was a deficiency of rainfall in all 3 seasons. Culticutting proved the most effective method of conserving available soil moisture. By 1954, however, the unmowed plots showed an increase in soil moisture retention at all depths, and there is strong evidence to indicate that the continued use of the unmowed system of culture may have a cumulative retentive effect on soil moisture.—Univ. Ill., Urbana. [For earlier reports see *H.A.*, 24:154 and 25: 186.]

3390. Roche, W. J.
Soil conservation in the granite belt (Queensland).
Qd agric. J., 1956, **82**: 71-80, 136-41, illus.

In this area sheet and gully erosion has developed as a result of heavy summer storms falling on soil with little or no cover. Soil conservation designs and layouts for orchards and vineyards are described.

Composition of fruit.

(*See also* 3264, 3315v, 3408l, x, 4294c.)

3391. Serini, G.
Correlazione tra tenore in 2–3 butilenglicole ed in acetilmetilcarbinolo e stato di maturazione dei prodotti frutticoli. Nota II.—*Pirus communis, Citrus Nobilis, C. sinensis, C. limonia, Musa sapientum, Prunus persica.* **(Correlation between 2-3 butylene glycol and acetylmethylcarbinol contents and stage of maturity in fruits. II. *Pyrus communis, Citrus nobilis, C. sinensis, C. limonia, Musa sapientum* and *Prunus persica.*)** [English summary 4 lines.]
Ann. Sper. agrar., 1956, **10**: 857-63, bibl. 10.

Data are tabulated for the contents of the 2 compounds in unripe, ripe and overripe pears, citrus, bananas and peaches.—Staz. sper. Fred., Milano. [For Part I on apples see *H.A.*, 26: 260b.]

3392. Koch, J., and Bretthauer, G.
Über den Vitamin-C Gehalt reifender Früchte. **(The vitamin C content of ripening fruits.)** [English summary 21 lines.]
Landw. Forschung, 1956, **9**: 51-61, bibl. 14.

The vitamin C content of ripening strawberries, cherries, currants, gooseberries, apples and pears was determined. Seasonal and varietal differences observed were fairly large. An inverse relationship was found to exist between summer rainfall and vitamin C content of berry fruits but the final vitamin C content depended much more on internal than on external factors. In rapidly-ripening berry fruits the final vitamin C content was higher than in pome fruits.

Harvesting, packing and storing.

(*See also* 3303, 3311, 3408d, e, h, k, m.)

3393. Patron, A., Swinzow, H., and Michel, F.
Étude de la maturation de l'abricot (var. Canino) au Maroc en vue de la mise en conserve. **(Maturation study of the apricot (var. Canino) in Morocco with regard to canning.)**
Fruits et Prim., 1956, **26**: 166-77, bibl. 13.

Three stages of fruit maturity are distinguished, namely green fruit (more than 50% green in the ground colour), turning (red replacing green), and mature for canning (green has disappeared). The limits of these 3 stages may be fairly well defined by analysis of the ground colour of the fruits, but each has corresponding physical and chemical properties which can be easily measured. For canning fruit which has passed the turning stage should be used.—I.F.A.C., Lab. Technol., Aïn-Sebaa, Morocco. [See also *H.A.*, 26: 1453.]

3394. Thorsrud, J., and Landfald, R.
Tilveksten hos eple den siste delen av veksttida. **(Growth increases in the apple during the last part of the growing season.)**
Frukt og Baer, 1956, **9**: 5-10, illus.

Weight and circumference of apples from 3 varieties, including Gravenstein, were recorded from 10th August to 19th October, 1955. Graphs illustrate the relationship between increases in weight and size and the percentage increase in weight from week to week during the experimental period. A table showing relative yields for 5 harvest dates between 7th September and 5th October is presented as an aid to calculating the losses that result from premature picking. Fruits growing on the south side of trees did not increase in size faster than other fruits but they were better coloured.—Hort. Res. Stat., Kise.

3395. Levin, J. H., and Gaston, H. P.
The three-team method of picking apples.
Quart. Bull. Mich. agric. Exp. Stat., 1956, **38**: 595-605, bibl. 1, illus.

In a commercial trial 3 picking teams were used, each picking at a different level of the tree [see also *H.A.*, 26: 1449]. The average rate of picking was increased, and the total per-bushel cost of picking was reduced.

The greatest number of bushels per man hour (10·7) was picked when the middle crew used step ladders and the top crew used mechanical booms, but per-bushels costs were higher by this method.

3396. Folley, R. R. W.
Economics of fruit farming, Report No. 3. Packing and storing fruit on the farm.
Rep. Dep. agric. Econ., Wye Coll., 1955, pp. 60, bibl. 4, 7s. 6d.

The purpose of this study is to marshal for fruitgrowers who are either beginning their marketing or contemplating its improvement some facts and observations upon privately-financed enterprises. The original material was obtained between 1951 and 1953 from 14 growers. A farm packing shed, erected as part of a combined installation for packing and storing, cost 2s. per bushel normal throughput, equal to a charge of £27 per bearing acre. When grading and packing costs were related to the output benefiting by the process, costs per bushel of apples and pears varied from between 7s. 3½d. and 2s. 4d. for Grade I, and between 3s. 5½d. and 1s. 8d. for Grade II. Separate evaluations are attempted of sorting, grading, wrapping and packing. The effect of size and quality of fruit upon output is noted. Reference to grading systems elsewhere suggests that market acceptance is at least as important as general quality of crop in determining what grades would prove profitable. Refrigerated gas stores were supplied at a cost of 20s. per bushel capacity for 30% of an average annual crop, equal to a charge of £85 per bearing acre. Computed inclusive costs for new independent stores of 5,000 bushels capacity varied between 13s. per bushel for air stores and 24s. 6d. for scrubbed gas stores. Actual storage costs on 9 farms for culinary apples averaged 3s. 0½d. per bushel into store, and 3s. 2d. per marketed bushel. Depreciation of stores and premises accounted for 75% of total annual costs in the first 10 years. Present trends indicate that storage of Cox's Orange offers the best prospects. Computed costs of producing market packs of apples and pears range from a maximum of 22s. 4d. per bushel for Cox's out of a scrubbed store marketed in non-returnable half-bushel containers, to a minimum of 7s. 8½d. for ungraded Bramley's marketed fresh in returnable containers, excluding transport and container charges.—[From author's summary.]

3397. Anon.
L'uso dell'ozono nel magazzinaggio freddo della frutta. (**The use of ozone in cold storage of fruit.**)
Riv. Ortoflorofruttic. ital., 1956, **40**: 133.

Ozone has proved a satisfactory disinfectant and deodorant for fruit stores. Most types of fruit should be exposed for several hours daily to 2–3 p.p.m. A refrigerating chamber of 1 cu.m. capacity for apples needs about 13 g. of ozone per hour at a minimal concentration of 1 p.p.m. Natural rubber in apparatus is destroyed by ozone, but synthetic rubber is resistant.

3398. Nyhlén, Å.
Hållbarheten hos 1955 års appleskörd. **(The keeping quality of the 1955 apple crop.)**
Fruktodlaren, 1956, **27**: 97-9.

The results of the latest apple cold storage trials, carried out annually at Helsingborg by the Swedish Cold Storage committee with Cox's Orange, Laxton's Superb and 3 other varieties, are tabulated and discussed. With the 1955 crop *Gloeosporium* rot was again the most important single cause of waste. [For an earlier report see *H.A.*, 25: 3734.]

3399. Smock, R. M.
Apple volatiles and their significance at storage temperatures.
Proc. Amer. Soc. hort. Sci., 1955, **66**: 111-17, bibl. 18.

The following observations indicate that apple volatiles stimulate ripening at storage temperatures. The vapours of ripe apples aspirated over preclimacteric apples made them respire and soften faster. Air purification with activated carbon, sulphuric acid or sodium hydroxide slowed down the ripening of preclimacteric apples in a recirculation system, indicating that auto-stimulation was checked. The fact that these materials do not remove ethylene in appreciable amounts indicates that non-ethylenic volatiles are involved in stimulation. Apples in open crates did not ripen as fast as those with slightly restricted ventilation. Variability in fruit firmness was greatest during the first 6 or 8 weeks of storage, indicating that the more mature apples stimulate the ripening of the less mature apples during the early storage period. Air purification with activated carbon may add as much as a month to the storage life of preclimacteric apples but had no effect on postclimacteric fruit. Air purification did not give adequate scald control.—Cornell Univ., Ithaca, N.Y.

3400. Meigh, D. F.
Volatile compounds produced by apples. I.—Aldehydes and ketones.
J. Sci. Food Agric., 1956, **7**: 396-411, bibl. 20.

Methods were developed for analysing the volatile aldehydes and ketones present in air surrounding gas-stored apples. Comparison of compounds produced by Cox and Laxton Superb (scald-resistant), and by Edward VII (scald-susceptible) showed no fundamental differences between the varieties. Acetone was predominant among the aldehydes and ketones evolved by the varieties.—Ditton Lab., Maidstone, Kent.

3401. Shutak, V., and Christopher, E. P.
Role of cutin in storage scald of Cortland apples.
From abstr. in *Plant Physiol.*, 1956, **31** (Suppl.): xl.

Scald did not develop in fruit in which part of the cutin was removed from a limited area before storage, or when these areas were covered with aluminium foil, paraffin or tape. Scald was reduced or eliminated in areas where the skin of the fruit was punctured before storage. Treatment was more effective before storage than later.—Univ. Rhode Is., Kingston.

3402. Hulme, A. C.
Carbon dioxide injury and the presence of succinic acid in apples.
Nature, 1956, **178**: 218-19, bibl. 2.

In stored apples CO_2 injury was accompanied by an increase in succinic acid in the tissues. Further details are to be published elsewhere.—Ditton Lab., Larkfield, Maidstone.

3403. Landfald, R.
Lagringsforsøk med epler 1948-1952. Gasslagring sammenlikna med lagring i kjølelager og ventilert lager. **(Gas storage of apples compared with cold storage and common storage.)** [English summary 2½ pp.]
Forskn. Landbruk., 1956, **7**: 205-55, bibl. 39, illus.

Gravenstein, Filippa, Bramley's Seedling, Åkerø and James Grieve were stored in iron drums in 3 types of store. In gas storage ripening was delayed in all the varieties tested. Firmness and contents of acids and soluble solids were lowest in the stores in which ripening had been most rapid. Weight loss was least in apples gas-stored in containers. The incidence of rots was least in gas stores. Considerable scald occurred in some varieties especially in gas stores; this damage was in some cases increased by the use of oil wrappers. The greatest amount of damage was due to internal necroses; low temperature damage and CO_2 injury could be avoided. Brown core occurred in all varieties and stores, although the amount was least in ventilated stores. In gas stores brown rot was least at 5% CO_2 and 3% O_2. Storage behaviour of the varieties is summarized.

3404. Gerhardt, F.
Use of film box liners to extend storage life of pears and apples.
Circ. U.S. Dep. Agric. **965**, 1955, pp. 28, bibl. 8, illus.

Evidence is presented that the appearance, storage life and dessert quality of Bartlett, Anjou, Comice and Bosc pears and Golden Delicious apples can be improved by the use of sealed Pliofilm, cellophane or polyethylene box liners. [See also *H.A.*, 25: 2508.] Certain precautions must be taken; the fruit should be free from surface abrasion and potential fungal infection and should be handled carefully to minimize bruising. J.R.L.

3405. Hansen, E.
Factors affecting post-harvest color development in pears.
Proc. Amer. Soc. hort. Sci., 1955, **66**: 118-24, bibl. 10.

Lack of yellow colour development in pears during ripening was found to be caused by incomplete decomposition of chlorophyll which tends to mask the appearance of carotenoid pigments. Fully ripe Anjou pears retain 50% or more of the chlorophyll originally present. Temperature did not have a differential effect on rate of colour development and ripening in Anjou pears, but in Bosc pears a temperature of 50° F. retarded fruit softening more than chlorophyll decomposition. Ethylene treatment for 24 hours before cold storage was effective in decreasing chlorophyll content of Bosc pears without increasing softness, but longer treatment caused fruit softening. Plastic film box liners retarded chlorophyll breakdown in Anjou pears during cold storage.—Ore agric. Exp. Stat., Corvallis.

3406. Claypool, L. L., Maxie, E. C., and Esau, P.
Effect of aeration rate on the respiratory activity of some deciduous fruits.
Proc. Amer. Soc. hort. Sci., 1955, **66**: 125-34, bibl. 15.

Data presented for apricots, pears and plums show that the rate of airflow over ripening fruits can materially affect the rate of CO_2 production and ripening. The factors affected are discussed.—Univ. Calif., Davis.

3407. Antoniani, C., Monzini, A., and Serini, G.
Conservazione sperimentale in atmosfera controllata di pesche "Hale". **(Gas storage experiment on Hale peaches.)** [English summary 2 lines.]
Ann. Sper. agrar., 1956, **10**: 899-904, bibl. 12.

Hale peaches were placed in storage at 1·5° C. and 90% R.H. with or without 5% CO_2 2–3 days after picking. The CO_2 did not significantly prolong storage life.—Staz. sper. Fred., Milano.

Noted.

3408.

a Anon.
Une variété de grenade sans pépin. **(A seedless variety of pomegranate.)**
Fruits d'Outre Mer, 1956, **11**: 229.
Cultivated in the Nizip district of Turkey.

b Barca, P.
Frukttretelling 1955. **(Fruit census 1955 [in Norway].)**
Frukt og Baer, 1956, **9**: 94-102.

c Blasse, W., and Freytag, H. E.
Pulfrichphotometrische Untersuchungen an *Prunus*-Artbastarden. **(Pulfrich-photometric studies on *Prunus* species hybrids.)**
Arch. Gartenb., 1955, **3**: 385-95, bibl. 6, illus.
Juice colour studies of progeny from crossing "Schattenmorelle" (*Prunus cerasus*) and "Dönissens Gelbe Knorpelkirsche" (*Prunus avium*).

d Bömeke, H.
Holzschutz im Obstlager. **(Wood preservation in fruit storage buildings.)**
Mitt. ObstbVersuchsringes Jork, 1956, **11**: 126-9, bibl. 6.
With an annotated list of chemicals tested by Jork Research Station. [See also *H.A.*, 25: 2511 and 26: 1464.]

e Crandall, P. C.
Preventing bruises on freestone peaches for canning.
Stats Circ. Wash. agric. Exp. Stats **237.** 1955, 1 folded sheet, bibl. 5, illus.
A summary of research findings.

f Davis, M. B.
Canada's fruit industry.
Reprinted from *Canad. geogr. J.*, September 1955, pp. 15, illus.
Tree and small fruits.

g Fritzsche, R.
Betriebsformen und Anbauformen im Obstbau. **(Type of holding and tree forms in fruit growing,)**
Schweiz. Z. Obst-u. Weinb., 1956, **65**: 167-9, 187-93, illus.

h GASTON, H. P., AND LEVIN, J. H.
Weighing cherries that are transported in water.
Quart. Bull. Mich. agric. Exp. Stat., 1956, **38**: 606-11, bibl. 1.
Four methods are described.

i HILKENBÄUMER, F.
Untersuchungen über den Einfluss verschiedener Sortenbestände, Anbauformen und Arbeitsverfahren auf die Wirtschaftlichkeit des Obstbaues. **(Studies on the effect of varietal layout, tree form, and management on fruit growing economics.)**
Reprinted from *9th Hochschultag. landw. Fakultät. Univ. Bonn, 1955*, pp. 10.
A discussion of conditions in Germany.

j HILKENBÄUMER, F., AND HEIBER, H.
Technisierungsstufen im Obstbau und ihre Auswirkungen auf die betriebswirtschaftlichen Verhältnisse. **(Mechanization on fruit farms and its effect on management.)**
Reprinted from *Rhein. Mschr. Obstb.*, 1956, No. 5, pp. 2.
A saving in costs achieved.

k HVEEM, H.
Norske felleslager for frukt. En summering og vurdering. **(Cooperative fruit storage in Norway. A survey and an appraisal.)**
Frukt og Baer, 1956, **9**: 37-73, illus.

l JOSLYN, M. A., AND PETERSON, R.
Occurrence of leuco-anthocyanin in pears.
Nature, 1956, **178**: 318, bibl. 7.
In the core tissue of the fruit and more especially in the seeds.

m KROCHMAL, A.
Apple storage in northern Greece.
Econ. Bot., 1956, **10**: 174-5.
Storage of apples in Macedonia is not yet highly developed.

n MOCHIZUKI, T., AND HANADA, S.
Seasonal changes in the constituents of young apple trees. Part I. Water and carbohydrates. [Japanese, with English summary 1 p.]
Bull. Fac. Agric. Hirosaki Univ., 1956, No. 1, pp. 27-40, bibl. 37.
Changes in 3-year-old Rolls apple trees as regards water and carbohydrate contents are described.

o POLLARD, A.
Cider fruit production.
Pamphl. Bath W. S. Co. Soc. **24**, 1956, pp. 31, bibl. 9.
Present trends and future prospects, with a note on establishment and management of orchards by E. W. Hobbis.

p POWELL, L. E., JR.
A study of some non-acidic growth substances in apple leaves.
Diss. Abstr., 1956, **16**: 228-9, being *Publ.* 15607 of 165 pp.
Preliminary extraction, purification and chromatography.

q RAMASWAMI, K.
Selected references on pomegranate (*Punica granatum* L.).
S. Indian Hort., 1955, **3**: 122-3, bibl. 44.

r RAO, V. N. M.
Value of root studies in determining optimum orchard culture.
S. Indian Hort., 1955, **3**: 89-99, bibl. 18.
The environmental factors controlling root growth are discussed.

s RØKHOLT, H. M.
Prøver med fruktsorter. **(Fruit variety trials.)**
Norsk Hagetid., 1956, **72**: 83-5.
Apples, plums and cherries.

t ROY, P.-O.
Description et appréciation des principales variétés de pommes. **(Description and appraisal of the principal varieties of apple.)**
Agriculture, Quebec, 1956, **13**: 43-5, illus.
For 24 varieties grown in Quebec province.

u SCHAER, E.
Bericht über die Sortenprüfung. **(Report on variety trials.)**
Schweiz. Z. Obst- u. Weinb., 1956, **65**: 305-8, 366-70.
Brief notes on 99 apple varieties tested at Wädenswil and found unsuitable.

v SPURLING, M. B.
Canning peach varieties.
J. Dep. Agric. S. Aust., 1956, **59**: 399-402, bibl. 2.
Data from a trial started in 1951–52 are given on canning quality and field performance.

w ULLAH, A., AND KARIMULLAH, —.
Proteins of mulberry leaves in silkworm feeding in the leaves of *Morus alba* Linn.
From abstr. in *Proc. 6th Pakistan Sci. Conf., Karachi, 1954, Part III*, p. 193.
Protein contents of dry and fresh leaves of 6 unnamed varieties tabulated.

x ULRICH, R.
Gradients physiques, chimiques et physiologiques des fruits. **(Physical, chemical and physiological variations within fruits.)**
Fruits d'Outre Mer, 1956, **11**: 239-44, bibl. 34, illus.
A discussion of progressive variations and their causes.

y WOOD, P. D.
Problems in detecting radiation from figs.
Proc. 10th annu. Res. Conf. Calif. Fig Inst., 1956, pp. 6-8.
A technique for detecting radiation for use in the study of a possible cancer-preventive factor [see *H.A.*, 26: 1915].

z YEAGER, A. F., AND MEADER, E. M.
A flesh-color chimera in the peach.
J. Hered., 1956, **47**: 77-8, bibl. 2, illus.
A peach hybrid produced fruits with chimeral distribution of white and yellow flesh.

SMALL FRUITS, VINES AND NUTS.

Small fruits.

(*See also* 3264, 3319, 3320, 3325, 3392, 3408f, 3456c, g-i, k, m, 3531, 4281, 4288, 4294a.)

3409. MEURMAN, O.
Uusien puutarhakasvien viljelymahdollisuuksista suomessa. **(On the possibility of growing new horticultural plants in Finland.)** [English summary ½ p.]
Reprinted from *Maatalous ja Koetoim.*, 1956, **10**: 39-47, illus.

Hardy American varieties of tree and small fruits are being tested at the Agricultural Research Centre, Piikkiö. Trials have shown that hardy vine varieties such as Beta and Fredonia, and the highbush blueberries June, Rancocas, Atlantic and Pemberton can be successfully cultivated in the southern parts of Finland. The results of crossing the wild species *Rubus arcticus* with raspberry have been very promising, and it is considered that the new hybrid varieties will be of great importance to the canning industry and in the production of liqueurs.

3410. JOHANSSON, E.
Sortförsök med svarta vinbar i Sverige 1943-1955. **(Variety trials with black currants in Sweden 1943-1955.)** [English and Esperanto summaries ½ p. each.]
Medd. Trädgårdsförs. Malmö **95**, 1956, pp. 19, bibl. 2.

Trials with English, Dutch, Finnish and Swedish varieties were carried out throughout Sweden. In southern Sweden Wellington XXX, Silvergieter, Seabrook and Edina gave the heaviest total yields. In central Sweden the highest yields were obtained from Wellington X and Brödtorp. Brödtorp, Janslunda and Östersund were the most reliable varieties in the north of Sweden. Boskoop Giant gave the lowest yields in all trials. [For an earlier report see *H.A.*, 22: 209.]

3411. HOBBIS, E. W., AND CATLOW, E.
A note on ten years cropping of black currants at Long Ashton.
A.R. Long Ashton agric. hort. Res. Stat. for 1955, 1956, pp. 61-3, bibl. 6.

In 1955 the 10th successive crop was picked from 7 acres of 6 varieties of black currant at Long Ashton [see also *H.A.*, 18: 2517b]. The yield of each variety was equal to, in one case, or more than 22·8 cwt. per acre, which was the average crop in England and Wales during the period 1944-52. The plants were grown on the hedgerow system at 8 ft. × 4 ft. or 10 ft. × 3½ ft. Observations indicate that given adequate disease and pest control the accepted cropping life of 10 years can be extended to 15 years or more.

3412. NEUMANN, U.
Die Bedeutung der Befruchtungsverhältnisse und Pflegemassnahmen für den vorzeitigen Früchtefall bei Schwarzen Johannisbeeren. **(The importance of pollination conditions and cultural measures in running-off of blackcurrants.)**
Arch. Gartenb., 1955, **3**: 339-54, bibl. 24.

Observations on several blackcurrant varieties have indicated that the predominant factor in fruit drop is pollination. Varietal differences in degree of self-fertility were observed, which were related to differences in seed number per berry. Varieties which had a low degree of self-fertility had a low seed number and heavy fruit drop even when cross-pollinated. Satisfactory fruiting of varieties not completely self-fertile was obtained by growing bushes next to at least 2 or 3 other varieties. Cultivation measures (pruning, manuring and irrigation) had no marked effects in the years observed. Hormone treatment was of no practical importance in reducing fruit drop.—Inst. Obstb. Obstzücht., Marquardt, Potsdam.

3413. NEUMANN, U.
Über Beziehungen zwischen Wuchsstoffgehalt und Fruchtentwicklung bei Johannisbeeren. **(The relation between hormone content and fruit development in currants.)**
Arch. Gartenb., 1955, **3**: 274-96, bibl. 27, illus.

The relation between fertility, ovule development and hormone content of fertilized fruits was studied in black and red currants. Ovule development was dependent on the position of the fertilized fruit in the inflorescence. Inhibition of development and degeneration of the ovules was often marked in the terminal flowers; the inhibition began before, as well as after, fertilization and resulted in reduced fertility. Paper chromatography indicated the presence of 3 hormones in fertilized ovules and fruits. Terminal fertilized fruits of the "Rote Holländische" variety with inhibited ovule development and reduced fertility contained less hormone than did basal fruits. Indolyl-3-acetic acid was markedly absent from the terminal fruits, but appeared there after removal of the basal fruits. In the variety "Rosenthals Schwarze" no differences in hormone content or ovule development were found. Removal of the basal fruits induced only a slight temporary increase in hormone content of terminal fruits. Comparative studies have shown a correlation between ovule development, fertility, weight of 100 currants and hormone content.—Inst. Obstb. Obstzucht., Marquardt, Potsdam. [For earlier results see *H.A.*, 24: 1237.]

3414. TEAOTIA, S. S., AND LUCKWILL, L. C.
Fruit drop in black currants: 1. Factors affecting "running off".
A.R. Long Ashton agric. hort. Res. Stat. for 1955, 1956, pp. 64-74, bibl. 6, illus.

Observations at Long Ashton do not support the conclusions of Wellington and others [*J. Pomol.*, 1921, 2: 160-98, see also Abstr. 3412, 3413], that inefficient pollination is the primary cause of "running off" in black currants. The berries towards the apex of the truss usually have fewer seeds and are more subject to running off than those at the base. The crux of the problem would therefore seem to lie in the factors responsible for this relatively low seed content. Microscopic observations suggest that the most important factor involved is abortion of a large proportion of seeds rather than failure of fertilization. The cause of this probably involves hormonal and nutritional factors and work on them is indicated.

3415. Wright, S. T. C.
Studies of fruit development in relation to plant hormones. III. Auxins in relation to fruit morphogenesis and fruit drop in the black currant *Ribes nigrum*.
J. hort. Sci., 1956, **31**: 196-211, bibl. 28, illus.

Ether extracts of black currant berries were made at weekly intervals from 18 days prior to fertilization until maturity. The auxins and growth-inhibitors in the extracts were separated, detected and assayed. At various stages throughout the growth of the fruit one neutral auxin and two acidic auxins were found, together with one acidic growth-inhibitor. One of the acidic auxins and the neutral auxin show many characteristics in common with IAA and IAN respectively. The other acidic auxin also is probably an indole derivative. Meristematic activity within the berry and the accumulation of reserve protein in the endosperm of the seed were found to coincide with the auxin peaks. The growth of the black currant fruit was correlated with the presence of one of the acidic auxins (IAA) and of the neutral auxin (IAN?). The peak concentration of the other acidic auxin was associated with a period of low fruit drop. A working hypothesis is suggested to account for the interaction of hormonal and nutritional factors in the control of fruit drop. [From author's summary.]—Long Ashton Res. Stat. [For Parts I and II on apples, see *H.A.*, 23: 1561 and 1562.]

3416. Luckwill, L. C.
Fruit drop in black currants: II. The effect of naphthalene acetic acid.
A.R. Long Ashton agric. hort. Res. Stat. for 1955, 1956, pp. 75-7, bibl. 3.

Naphthaleneacetic acid at 10 p.p.m. was sprayed on bushes of Seabrook's Black and Westwick Choice at the flower bud stage or just before the early drop in order to reduce running off. Both treatments actually resulted in increased fruit drop, though following the later application the decreased set was compensated for by increased berry weight.

3417. Statens Forsøgsvirksomhed i Plantekultur.
Forsøg med beskaering af solbaerbuske. **(Trials on the pruning of blackcurrants.)**
Erhvervsfrugtavl., 1956, **22**: 227-8.

In a comparison of 4 pruning treatments of closely planted blackcurrants the best results were obtained with slight to medium thinning of the bushes. Although the untreated controls gave somewhat higher yields, the better quality of the berries from pruned plants more than compensated for the loss in weight. In addition, pruning facilitated both cultivation in the autumn and disease and pest control. The trials were carried out for various periods at the 4 main Danish horticultural research stations.

3418. Bould, C., and Bradfield, E. G.
Foliar analysis in relation to black currant nutrition: 1. Investigations on leaf disc sampling.
A.R. Long Ashton agric. hort. Res. Stat. for 1955, 1956, pp. 93-7, bibl. 3.

A comparison of disc *versus* whole leaf-plus-petiole samples of black currant leaves showed no significant differences in nitrogen status, but the disc samples were significantly lower in potassium. With one exception the removal of one to three discs from the same leaf had no effect on the nitrogen or potassium status of subsequent disc samples. [Authors' summary.]

3419. Christ, E. G.
Blueray—a new variety.
[*Proc.*] *24th annu. Blueberry Open House*, N.J. agric. Exp. Stat., 1956, p. 4.
(Hough, L. F.)
New blueberry named Blueray.
N.J. Agric., 1956, **38**(1): 15, illus.

This variety is considered as a replacement for Rancocas. It has been consistently productive in Michigan, New Jersey and New England, but needs rather heavy pruning and heavy fertilization. It is easily propagated by hardwood cuttings, and has firm light blue berries which are resistant to cracking.

3420. Scott, D. H., and Ink, D. P.
Treatments to hasten the emergence of seedlings of blueberry and strawberry.
Proc. Amer. Soc. hort. Sci., 1955, **66**: 237-42, bibl. 8.

Soaking blueberry seeds in chlorine solution (1% sodium hypochlorite) did not improve germination, and treatment for 12 hours or more severely damaged or killed the seeds. After-ripened blueberry seeds emerged earlier than non-after-ripened seeds but the final percentage germination was lower. The effect of chlorine treatment on strawberry seeds was related to their parentage, emergence being hastened in some crosses and the seed being injured or unresponsive in others. After-ripening strawberry seed at 36° F. for 1 month increased the rate of emergence, and the final percentage germination was the same for treated and untreated seed.—U.S. Dep. Agric., Beltsville, Md.

3421. Kluge, K., and Kramer, S.
Über die stimulierende Wirkung des Colchicins bei der Samenkeimung von *Fragaria* und *Vaccinium*. **(The stimulation of seed germination in *Fragaria* and *Vaccinium* by colchicine.)**
Arch. Gartenb., 1955, **3**: 355-61, bibl. 5.

Colchicine treatment of seeds of a diploid and tetraploid variety of *Fragaria vesca* increased germination; the effect being more marked in the diploid than in the tetraploid variety. The most favourable effect on germination of freshly-harvested seed of *Vaccinium myrtillus* was obtained after treatment with a 0·3% colchicine solution for 24 hours. After 6 months' storage germination of *V. myrtillus* seed was markedly reduced, but colchicine treatment (0·25% for 24 hours) largely overcame this reduction. Stored seed of *V. corymbosum* showed a smaller reduction in germination ability, and colchicine treatment was less effective in overcoming it.—Inst. Obstb. Obstzucht., Marquardt, Potsdam.

3422. Struchtemeyer, R. A.
For larger yields irrigate lowbush blueberries.
Me Fm Res., 1956, **4**(2): 17-18, illus.

The results of 7 years' irrigation trials on blueberry fields are given. The irrigation of blueberries was found to be worth while, especially on first-crop land with a high yield potential. Adequate water was found to be most critical while the berries were developing. The quality of the berries was improved by irrigation. Soil moisture measuring equipment is thought to be necessary in order to obtain the best results. J.R.L.

3423. TREVETT, M. F.
Observations on the decline and rehabilitation of lowbush blueberry fields.
Misc. Publ. Me agric. Exp. Stat. **626**, 1956, pp. 21, bibl. 11, illus.

The essential reason for a declining yield of lowbush blueberries is the senescence and death of part of the rhizome system. Burning contributes to it, hence the development of a substitute such as herbicidal oils or mechanical processes would be valuable. Mulching, not necessarily with organic material, is particularly useful in protecting the rhizomes. How and when, in relation to burning, such mulches might be applied in connection with fertilizers is considered in detail.

3424. RAKE, B. A.
The propagation of gooseberries: III. The effect of time of taking and planting hardwood cuttings and the influence of buds on rooting.
A.R. Long Ashton agric. hort. Res. Stat. for 1955, 1956, pp. 78-86, bibl. 3.

Conclusions reached from 1954/55 trials at Long Ashton are as follows: Time of taking cuttings was important for the rooting of cuttings, September, October and November giving the best results. Heeling in these cuttings and planting in February under good conditions gave better results than immediate planting under bad soil conditions. The retention of buds on the lower part of the cutting was beneficial to cuttings taken and planted in August, had no effect on those taken and planted in September, October and November and an ill effect on those taken and planted in December, January and February. [For Part II see *H.A.*, 26: 266.]

3425. GROLLEAU, J., AND PREVOST, H.
Observations sur le comportement de différentes variétés de fraisiers. **(Observations on the behaviour of various strawberry varieties.)**
Terre maroc., 1956, **30**: 155-9.

Data on yields, season of production and storage quality were collected in a trial of 33 strawberry varieties [for an earlier report see *H.A.*, 25: 2526]. It is recommended that plantations should be renewed biennially.—Stat. rég. hort., Aïn Taoujdat.

3426. KOLBE, M. H.
On-the-farm strawberry variety trials.
Proc. Amer. Soc. hort. Sci., 1955, **66**: 254-7.

Of 35 varieties tested in West Virginia over a 5-year period Fairland, Vermilion, Robinson and virus-free Catskill were outstanding. All were quite widely adapted, excepting that Robinson did much better on the lighter soils and at higher altitudes.—W. Va Univ., Morganstown.

3427. JORDAN, C., AND v. SENGBUSCH, R.
Ein Beitrag zur Anerkennung von Erdbeerpflanzgut. **(A report on the roguing of strawberry stock plants.)**
Züchter, 1956, **26**: 172-4.

Selection of strawberry stock plants which are true to type and healthy may be complicated by the presence of non-flowering maidens and seedlings. Non-flowering in first-year plants is generally due to environmental conditions, and such plants need not be rejected. Studies with many clones and varieties have shown that in about 50% of the clones tested between 1 and 10 seedlings were produced per parent plant. This is an additional reason for taking runners only from first-year beds.—Max-Planck-Inst. f. Züchtungsforsch., Hamburg-Volksdorf.

3428. ARNEY, S. E.
Studies of growth and development in the genus *Fragaria*. VIII. The effect of defoliation on leaf initiation and early growth of the leaf initials. [Spanish summary 13 lines.]
Phyton, 1956, **6**: 109-20, bibl. 17.

Experiments were carried out on defoliated and partially defoliated strawberry plants (M.48 Royal Sovereign). Defoliation hastened the time of emergence of the subsequent first and second leaves, but this effect was cancelled by the application of indoleacetic acid to the cut ends of the debladed petioles. Leaf initials were counted and measured, and it was shown that the meristematic tissues of the apex and of the leaf initials of all ages are similar in their reactions to defoliation and auxin application. Total defoliation had much the same effect as partial defoliation, and feeding sugar through the cut ends of the petioles had no observable effect.—University College, Cardiff. [For Parts VI and VII see *H.A.*, 26: 2531 and 1480.]
J.R.L.

3429. DARROW, G. M.
Effect of temperature and day length on varietal adaptation of strawberry.
Fruit Var. hort. Dig., 1955, **10**: 37-40, 51-4, illus.

Strawberry varieties differ markedly in their responses to day length and temperature, not only as regards time of flower bud initiation, but in such characters as flavour and firmness of fruit. The effects of this are discussed in relation to choice of varieties and patterns of fruit production in different parts of the U.S. and certain other countries. Although fresh strawberries are now marketed throughout the year in the U.S., there is a need to make the production of everbearing varieties less risky and to control losses of these plants under mulches and also to develop two-crop and summer- and autumn-crop varieties for certain areas. The gene for summer fruiting found in *Fragaria ovalis*, the wild strawberry of western north America, might be useful in breeding for this purpose.—U.S.D.A., Beltsville, Md.

3430. GUTTRIDGE, C. G.
Photoperiodic promotion of vegetative growth in the cultivated strawberry plant.
Nature, 1956, **178**: 50-1, bibl. 2.

The strawberry variety Royal Sovereign is a short-day plant, flower initiation being promoted by short photoperiods, whereas stolon formation and increased petiole length is promoted by long photoperiods. In 1947 Hartmann had shown that parent plants of the Missionary variety growing in short photoperiods are able to induce flower formation in attached runner plants growing in long photoperiods, which suggests the transmission of a flower-forming substance along the stolon in an acropetal direction [*H.A.*, 18: 910]. By growing Royal Sovereign parent and runner plants connected by a stolon under short-day (9 hours) and long-day (continuous light) conditions respectively, and superimposing 4 defoliation treatments on the runner plants, evidence was presented for the transmission in a basipetal direction along the stolon of a substance or substances promoting stolon formation and petiole elongation and antagonizing the processes leading to flower formation. The tabulated results also show that the effect of the treatment on the parent plants was proportional to the number of leaves retained on the runner plants. Further work is in progress.—Scottish hort. Res. Inst., Mylnefield, Invergowrie, Dundee.

3431. Downs, R. J., and Piringer, A. A.
Differences in photoperiodic responses of everbearing and June-bearing strawberries.
Proc. Amer. Soc. hort. Sci., 1955, **66**: 234-6, bibl. 7.

The June-bearing varieties Climax and Howard 17 initiated flower primordia at 11- and 13-hr. photoperiods, whereas Klondike only did so at the former. Neither Howard 17 nor Klondike produced an appreciable number of visible flower clusters, whereas Climax did, at 11- and 13-hr. photoperiods. Climax and Klondike were similar in their runner formation at all 4 photoperiods tested. Howard 17 produced about the same number of runners as Climax and Klondike at 15- and 17-hr. photoperiods but far fewer at 11- and 13-hr. ones. The everbearing varieties Gem, Mastodon and Red Rich required long photoperiods for the maintenance of flower production, but produced most runners with a 13-hr. day.—U.S. Dep. Agric., Beltsville, Md, and Univ. Minn., St. Paul.

3432. Stolle, G.
Über den Einfluss von Düngungsmassnahmen auf die Merkmale Ertrag, Fruchtzahl und durchschnittliches Einzelfruchtgewicht je Pflanze, deren Variabilität und Zusammenhänge bei Treiberdbeeren. (**The effect of manuring on yield, fruit number and average single fruit weight per plant, their variability and relationships in forcing strawberries.**)
Arch. Gartenb., 1955, **3**: 373-84, bibl. 7, illus.

In pot experiments 1-year-old plants of Deutsch Evern and Müncheberger Frühe received applications of N, P, K and NPK. Results showed a favourable effect of N on yield and fruit number per plant. Manuring with P slightly increased yield and fruit number over those of the control. No effect of K manuring was observed. Little effect of manuring was apparent in weight of single fruits.—Inst. Obstb. Obstzücht., Marquardt, Potsdam.

3433. Harris, G. H.
The effects of micro-elements on strawberries mulched with sawdust.
From abstr. in *Agric. Inst. Rev.*, 1956, **11**(3): 41.

In a strawberry plantation, where sawdust mulch plus fertilizer was compared to clean cultivation plus fertilizer and to farmyard manure, the sawdust-treated plots gave the highest yields. The effects of B, Cu, Mn and Zn applications were most pronounced on sawdust-treated plots.—Univ. B.C., Vancouver.

3434. Harrold, L. L.
Evapotranspiration rates for various crops.
Agric. Engng St. Joseph, Mich., 1955, **36**: 669-72, bibl. 6.

Fibre glass-gypsum blocks were used on strawberry and other plots to evaluate soil-moisture changes and evapotranspiration. They showed that first year strawberry plants consumed moisture from an 18-in. soil depth at a rate of 0·23 in. per day for an 8-day period in July. Moisture extraction patterns as determined from the blocks indicate that the maximum depth of soil to be considered for irrigation of strawberries under the conditions obtaining in the trial was say 14 in. In point of fact most of the moisture extracted by the fibre glass blocks in the strawberries came from the first 10 inches of soil.

3435. Iljinskiĭ, A. A.
The effect of irrigation on fruit bud initiation in strawberries. [Russian.]
Sad i Ogorod, 1956, No. 7, pp. 38-9.

In the southern U.S.S.R. high strawberry yields can be maintained only when the crop is irrigated during dry seasons. Observations in the Krasnodar region showed that in an early strawberry variety irrigated on September 15 100% of the flower buds were differentiated by September 30, while on unirrigated plants no flower buds were found at that date. On a midseason variety the corresponding figures were 76% and 6% and on a late variety 24% and nil. The quick response to irrigation shown by the early and midseason varieties indicates that to prevent autumn flowering those varieties should not be irrigated between early August and September 15.

3436. Crang, A., and Sturdy, M.
A comparison of some varieties of fruit preserved by bottling and by freezing: progress report VI.
A.R. Long Ashton agric. hort. Res. Stat. for 1955, 1956, pp. 182-7, bibl. 2.

Fourteen varieties of raspberry and 9 varieties of strawberry were assessed during 1955 for their fresh fruit, bottling and freezing qualities. Colour and flavour were so well retained in bottled fruit stored at 38° F. that it was rated higher than frozen fruit: bottled fruit stored at room temperature was much poorer in appearance. Eight varieties of pear were included in the bottling trials. [Authors' summary.]

3437. Nikitin, G. I.
Elaeagnus macrophylla. [Russian.]
Priroda, 1956, **45**(4): 117, illus.

In the Soviet Union gumi (or goumi), *E. macrophylla*, is found only on the island of Sakhalin where it was introduced from Japan. The fruits of this shrub are edible and contain 45 mg./% vitamin C, 12·7% acid and high tannin contents. Gumi is propagated by division or seed which should be planted while still in the ripe fruit.

Vines.

(*See also* 3409, 3456a, b, e, f, j, l, n, o.)

3438. Levadoux, L.
Les populations sauvages et cultivées de *Vitis vinifera* L. **(Wild and cultivated populations of *Vitis vinifera*.)** [English, German and Russian summaries ⅓ p. each.]
Ann. Amél. Plantes, 1956, **6**: 59-118, bibl. 85, illus.

The author discusses the phylogenetic relations which may exist between the cultivated grape (*sativa* form) and the wild vine (*silvestris* form) of western Eurasia.

3439. Santos (Neto), J. R. A.
Melhoramento da videira. **(Breeding of grape vines.)** [English summary ⅓ p.]
Bragantia, 1955, **14**: 237-58, bibl. 18, illus.

The technique of hybridization is described. The necessary characteristics of varieties intended for wine production, juice extraction, raisin production and for use as rootstocks are enumerated and examples are given of suitable varieties bred for cultivation in Brazil. The progress of breeding is reported.

3440. Capria de Fleitas, M. H., and Vega, J.
Estudio de algunos caracteres ampelométricos desde el punto de vista de la diagnosis varietal. **(Study of some ampelographic measurements in vines from the point of view of varietal diagnosis.)**
Rev. Invest. agric. B. Aires, 1956, **10**: 49-64, bibl. 15, illus.

A detailed statistical study, using leaves of 10 vine varieties native to S. America, was made of relationships between (1) vein lengths, (2) angles between veins, (3) length of petiole and length of central main vein, and (4) distances of primary leaf indents from the petiole junction and lengths of lateral main veins. It was concluded that these biometric methods have a definite value in recognition of varieties, but are not sufficiently precise to replace the traditional methods of identification.

3441. Briza, K.
Physical resistance of the berries of common varieties of table grape vines. [Serbian, with English summary 1 p.]
Rev. Res. Work Fac. Agric. Belgrade, 1955, **3**(2): 75-82, bibl. 6, illus.

An illustrated description is given of an apparatus designed for testing the physical resistance of grapes. The values are expressed in grammes pressure per square millimetre which the grape can withstand before it is crushed. The average resistance values over 4 years for the 4 varieties tested were: Aphus-Ali 6·21, Muscat of Hamburg 4·84, Red Chasselas 5·25, and Csaba Gyöngye 4·08. Differences between mean annual values within the varieties were not very great; these mean values are of importance only for handling during harvest and transport. Differences between minimum and maximum values within the varieties were very large; the maximum values are of importance for processing.

3442. Oknina, E. Z., and Kuzjmin, A. Ja.
A study of the depth of dormancy in vines as a factor of frost resistance under conditions of northern viticulture. [Russian.]
Trud. Inst. Fiziol. Rast. Timiryazeva, 1955, **9**: 106-42, bibl. 59, illus.

Field observations and laboratory studies showed a positive correlation between the depth of dormancy and frost resistance in vine varieties. In the laboratory the intensity of rest was evidenced by certain biochemical processes, especially by the changed character of the protoplasm. Different degrees of protoplasm separation and rates of storage material transformation were established for groups of vine varieties of different frost resistance. Thus in very resistant varieties a very high degree of protoplasm separation, thorough starch transformation and deposition of lipoids and fats on the surface of the protoplasm took place which protected them from low temperatures. As a result, during temporary favourable growing conditions the dormancy of this group of vines remained unbroken. In frost-resistant, partially frost-resistant and susceptible varieties the processes described were progressively less complete and more easily reversed, and accordingly the plants came out of dormancy with progressively greater ease.

3443. Briza, K., and Milosavljević, M.
Studies on the fruitfulness of vine buds during dormancy. [Serbian, with German summary ½ p.]
Rev. Res. Work Fac. Agric. Belgrade, 1955, **3**(2): 91-4, bibl. 7.

The practical value of the method of estimating during dormancy the number of inflorescences per bud, described earlier [see *H.A.*, 25: 2546], was confirmed in 1955.

3444. Maxwell, N. P.
Propagating Vinifera grapes in the Lower Rio Grande Valley of Texas.
J. Rio Grande Valley hort. Soc., 1956, **10**: 156-7.

The writer recommends that vines should be grafted after being set in their permanent sites, as this has proved more successful than the normal bench grafting. The rootstocks should be cleft-grafted within 7 days of planting, and the grafts earthed up to just below the top bud of the scion until union has taken place, to prevent drying out. J.R.L.

3445. Shaulis, N., and Kimball, K.
Effect of plant spacing on growth and yield of Concord grapes.
Proc. Amer. Soc. hort. Sci., 1955, **66**: 192-200, bibl. 5.

Spacing trials were carried out over a 10-year period with Concord vines, planting densities ranging from 414 to 908 vines per acre. The vines were balance-pruned to the scale of 30+10 (30 buds retained for the first lb. of cane prunings and 10 additional buds for each additional lb.). As vine density increased there was a decrease in pruning weight and yield per vine, but an increase in pruning weight and yield per acre. Wide differences in the fruitfulness of the buds were recorded as a result of location, year, vine density or vine arrangement. The combination of wide row spacing and narrow vine spacing was inferior to a more nearly square spacing. The commonly used 9×8 ft. spacing is considered the widest possible spacing for high acre yields at 30+10 pruning. A density of 600 to 700 vines per acre appeared desirable.—N.Y. St. agric. Exp. Stat., Geneva.

3446. Tomkins, J., and Shaulis, N.
The Catawba grape in New York. I. Some fruiting characteristics of the cane and shoot.
Proc. Amer. Soc. hort. Sci., 1955, **66**: 209-13, bibl. 4.

The length of canes of Catawba vines trained to the Keuka high renewal system had a marked effect on yield. In 9-node canes the distal 3 nodes produced approximately as much fruit as the basal 6 nodes. It is considered that growers could profitably prune canes to 10 buds, and that the use of canes 6–7 buds or less in length is a major factor responsible for excessive vegetative growth and light yields.—N.Y. St. agric. Exp. Stat., Geneva.

3447. Tomkins, J., and Shaulis, N.
The Catawba grape in New York. II. Some effects of severity of pruning on the production of fruit and wood.
Proc. Amer. Soc. hort. Sci., 1955, **66**: 214-19, bibl. 5.

Over a 4-year period Catawba vines were pruned at 7 rates, ranging from 10 to 40 buds per vine for the first lb. of prunings, in all cases 8 additional buds being left for each additional lb. of prunings. Increases in severity of pruning were associated with (1) decrease in yield per vine, (2) increase in yield per 100 buds, (3) increase in number of clusters per bud, and (4) increase in weight of prunings. It is considered that the 40-bud pruning is too light owing to the excessive production of small shoots, and it is suggested that under New York conditions Catawba vines should be pruned to 25 buds for the first lb. of prunings with 10 additional buds for each additional lb.—N.Y. St. agric. Exp. Stat., Geneva.

3448. Avramov, L.
A study of the morphological structure and physiological function of flowers in the more important indigenous and some foreign vine varieties. [Serbian, with English summary $\frac{3}{4}$ p.]
Rev. Res. Work Fac. Agric. Belgrade, 1955, 3(2): 61-74, bibl. 14, illus.

Vine varieties studied were classified into 2 groups, i.e., those with morphologically and functionally hermaphrodite flowers and those with morphologically hermaphrodite but functionally female flowers. In varieties belonging to either of these 2 main groups floral types occurred with morphologically and functionally male flowers, morphologically hermaphrodite and functionally male flowers and morphologically hermaphrodite but functionally sterile flowers.

3449. Avramov, L.
A study of pollination and fertilization in the more important indigenous and some foreign vine varieties. [Serbian, with English summary 1 p.]
Rev. Res. Work Fac. Agric. Belgrade, 1955, 3(2): 83-90, bibl. 7, illus.

In varieties with morphologically and functionally hermaphrodite flowers pollination takes place before the flower cap is pushed off and before the stigmas produce a secretion. They are usually self pollinating. Pollen germination in these varieties takes place after the flower cap has dropped, i.e. immediately after stigmatic secretion. Abnormal cases of cleistogamy have also been observed in vines with this floral type. In varieties with morphologically hermaphrodite, but functionally female, flowers self pollination occurs in the same way as in varieties with functionally hermaphrodite flowers; since, however, their pollen is sterile, foreign pollen is necessary for fertilization.

3450. Weaver, R. J.
Plant regulators in grape production.
Bull. Calif. agric. Exp. Stat. **752**, 1956, pp. 26, bibl. 9, illus.

An account of the application of growth substances instead of girdling to induce set in Black Corinth and Thompson Seedless grapes. It was found that the use of 4-CPA [=PCPA or 4-chlorophenoxyacetic acid or para-chlorophenoxyacetic acid] achieves a good set in Black Corinth and large berries and that BOA [or benzothiazol-2-oxyacetic acid] produced a good set with smaller berries. Thompson Seedless treated with these substances produces larger berries with firmly attached pedicels, is less subject to berry shatter and may experience a slight delay in maturity when 4-CPA is used. Delaying maturity in Thompson Seedless, Zinfandel and Ribier varieties with BOA depends on proper timing and concentration, which are considered in detail. [See also *H.A.*, 26: 303.]

3451. Sharples, G. C., Hilgeman, R. H., and Milne, R. L.
The relation of cluster thinning and trunk girdling of Cardinal grapes to yield and quality of fruit in Arizona.
Proc. Amer. Soc. hort. Sci., 1955, **66**: 225-33, bibl. 7.

Yield of fruit was reduced and time of maturity advanced in proportion to the amount of cluster thinning done. Maximum fruit size tended to occur on vines which were thinned to an average of 1 cluster per shoot. Early girdling gave significantly higher yields than late or no girdling as a result of increased fruit size. Late girdling resulted in the earliest maturity and the highest total soluble solids content. In general girdling tended to enhance the effect of thinning. Cluster size and number of shot-berries in the clusters were unaffected by thinning and girdling practices. The optimum time for girdling appeared to coincide with the first appearance of colour in the fruit.—Univ. Ariz. agric. Exp. Stat., Tucson.

3452. Grill, F.
Die Anwendung der Blattanalyse im Weinbau. (**The application of leaf analysis in viticulture.**) [English, French and Spanish summaries 11 lines each.]
Mitt. Klosterneuburg, Ser. A, 1956, **6**: 107-14, bibl. 6.

Contents of Mg, K_2O and P_2O_5 were determined in leaves from plants receiving mineral manuring. The optimum nutrient levels in the leaves could not be determined by comparison of mineral contents. It was not possible to find reproducible differences between leaves of different vine-varieties or between leaves taken from different stem levels. Magnesium-deficiency symptoms were related to the K_2O/Mg ratio in the leaf, but the variation from normal was only slight. Petiole studies gave similar results.

3453. Archibald, J. A.
Grape nutrition studies in Ontario.
From abstr. in *Agric. Inst. Rev.*, 1956, **11**(3): 36.

In a number of vineyards in the Niagara Peninsula soil and petiole analyses were made in 1954. A correlation was found between petiole K-content and yield, and also between soil type, petiole K-content and yield.—Ont. Dep. Agric., Vineland.

3454. Ballatore, G. P.
Esperienze di concimazione della vite in Sicilia. **(Fertilizer trials on vines in Sicily.)**
Riv. Vitic. Enol., 1956, **9**: 107-15.

P, NP and NPK as complete fertilizers or mixtures of single fertilizers were applied in trials in a vineyard on terra rossa soil in the Marsala district. The weather was found to be the chief factor controlling yield and the effectiveness of the fertilizers. A significant yield increase was given only by N, and then only in one year out of 4. The richer mixtures of single fertilizers consistently gave slight improvements in yield and in the composition of must and wine compared with the less rich mixtures, the complete fertilizers and the control.

3455. Winkler, A. J., and Lamouria, L. H.
Machine harvesting of grapes.
Calif. Agric., 1956, **10**(5): 9, 14, illus.

After special trellising and training of the vine fruiting wood to bring all of the bearing units to one side of the row, it was found possible to harvest the crop mechanically. The mechanism of the harvester is described and front and side elevation diagrams are given.

J.R.L.

Nuts.

(*See* 3319, 3325, 3340, 3354, 3358, 3456d, p-r.)

Noted.

3456.

a Bruni, B.
Verdicchio bianco. **(White Verdicchio.)** [Italian, with English summary ¼ p.]
Ann. Sper. agrar., 1956, Vol. **10**, No. 3, Suppl. pp. xi-xx, bibl. 12, illus.
A common white wine grape variety in Ancona province.

b Bruni, B.
Nuragus. **(Nuragus.)** [Italian, with English English summary ¼ p.]
Ann. Sper. agrar., 1956, Vol. **10**, No. 3, Suppl. pp. i-ix, bibl. 12, illus.
A common white wine grape variety in the province of Cagliari.

c Christ, E. G.
Jerseybelle strawberry.
Fruit Var. hort. Dig., 1955, **10**: 61.
Released by the N.J. agric. Exp. Stat. and described briefly.

d Conway, T.
More tree nuts should be grown.
N.Z. J. Agric., 1956, **92**: 383-92, bibl. 8, illus.
The culture of walnuts, almonds and hazel nuts is described.

e Cosmo, I., Comuzzi, A., and Rubin, V.
Indagini sulla ricostituzione viticola della Venezie ai fini dell'orientamento per i futuri impianti. . . . Provincia di Padova, terzo contributo. . . . **(Studies on vineyard reconstruction in Venetia with a view to future planting. Province of Padua, 3rd contribution. Zone of the Euganei Hills: soils inducing little or no chlorosis.)** [English summary 7 lines.]
Ann. Sper. Agrar., 1956, **10**: 783-812, illus.
Variety and rootstock trials; for parts 1 and 2 see *H.A.*, 26: 1510h and 2558i.

f Dalmasso, G.
Aspetti e problemi della viticoltura elbana. **(Vine growing in Elba.)**
Riv. Vitic. Enol., 1956, **9**: 63-6, illus.

g Hill, R. G., Jr.
Strawberry varieties evaluated for Ohio producers.
Ohio Fm Home Res., 1956, **41**: 13, 15, illus.
Armore, Dixieland, Erie, Pocahontas and Tennessee Beauty.

h Khan, K. F., and Gowder, R. B.
The cape gooseberry—a remunerative intercrop for orchards in the Nilgiris.
S. Indian Hort., 1955, **3**: 104-7.

i Khan, O. R., and Wilcox, A. N.
Vegetative vigour in strawberry in relation to methods of breeding: a comparison of the self and cross progenies from several selected inbred clones and from the varieties from which they were derived.
From abstr. in *Proc. 6th Pakistan Sci. Conf., Karachi, 1954, Part III*, pp. 78-9.
A study of hybrid vigour.

j Manzoni, L.
Il vinacciolo. Sua struttura e sua composizione. **(The structure and composition of the grape pip.)**
Riv. Vitic. Enol., 1956, **9**: 98-106, bibl. 1, illus., 131-42, bibl. 14, illus.

k Moulton, J. E., and Johnston, S.
The breeding value of 35 strawberry varieties tested in Michigan.
Proc. Amer. Soc. hort. Sci., 1955, **66**: 246-53, bibl. 5.

l Negroul, A.-M.
Les travaux ampélographiques en U.R.S.S. **(Ampelographical work in the U.S.S.R.)**
Bull. Off. int. Vin, 1956, **29**(301): 8-12.
A review.

m RAEN, F.
Blåbaerdyrkningens betydning. **(The importance of blueberry growing.)**
Horticultura, 1956, **10**: 67-8, illus.
With special reference to North America, but Finland, Germany and Holland are also briefly considered.

n RAO, K. R.
Training and pruning of grape vines in South India.
Indian J. Hort., 1955, **12**: 157-64, bibl. 4, illus.
Methods adapted to the vigorous growth and heavy yields of the area.

o REGGIANI, F.
Una nuova varietà di uva da tavola: l'Anna Maria (U. n. 4). **(The new white dessert grape, Anna Maria.)**
Fruttic.,* 1956, **18**: 259-65, bibl. 7, illus.
Very early and travels well.

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* Formerly *Riv. Fruttic.*

p RUDOLPH, V. J., AND ROBBINS, P. W.
Growth of planted black walnut on the Michigan State University campus.
Quart. Bull. Mich. agric. Exp. Stat., 1956, **38**: 520-3, bibl. 2.
For forestry purposes.

q SZENTIVÁNYI, P.
A dió minősítése. **(Grading of walnuts.)**
Kert. Szől., 1954, No. 11, p. 6, from abstr. in *Hung. agric. Rev.*, 1955, **4**(1): 7-8.
A method of evaluating walnuts from seedling trees.

r VALLS, M.
La avellana y sus problemas. **(The hazelnut and its problems.)**
Rev. Inst. agric. Catalan, 1956, **105**: 119-23.
Economics of marketing and export in Spain.

PLANT PROTECTION OF DECIDUOUS FRUITS.

General.

(*See also* 3597 l, o, v, z, 3598q, x, 4294a.)

3457. INGRAM, J., AND COGHILL, K. J.
Fruit section.
A.R. Luddington exp. Hort. Stat. 1955, 1956, pp. 8-18.

Strawberries: in a year of low *Botrytis* incidence sprays of captan and thiram slightly reduced the *Botrytis* percentage, but time of application was not important. *Apples:* planting systems trial. *Plums:* Bordeaux mixture (4/6/100) applied 3 weeks after petal fall reduced the severity of the leaf spot stage of bacterial canker, but stem canker incidence was not affected. *Blackcurrants:* CPBS and Schradan have given good control of mites (*Tetranychus telarius*) up to the beginning of August in 3 successive years, and TEPP, CPCBS and chlorbenside in 2 successive years.

3458. WARNER, R. M.
1955 insecticide and fungicide experiments.
Proc. 10th annu. Res. Conf. Calif. Fig Inst., 1956, pp. 13-17.

From experiments in 1954-55 it has been shown that dieldrin increases the percentage of good fruit; it gives variable control of the vinegar fly (*Drosophila melanogaster*) but tends to keep the infestation at a low level so long as there are no split fruits. It is recommended that the fruit should be kept clean and only light or medium caprification practised, as heavy caprification increases the tendency of the fruit to split. Malathion and molasses increased the percentage of good fruit. Dieldrin gave good control of the dried fruit beetle. Captan and Perthane-Dithane sprays and Manzate dust failed to control mould, which was thought to be caused by thrips or mite infestation earlier in the year.
J.R.L.

3459. STUBBS, L. L.
Diseases of strawberries.
J. Agric. Vict., 1956, **54**: 232-6, bibl. 5, illus.

In Victoria virus degeneration is the most serious trouble affecting strawberries and a runner certification scheme is to be introduced. In one district a root-rot disease is prevalent, the cause of which is still uncertain. The leaf symptoms of affected plants resemble those of Ca deficiency, but 5-ton lime applications in the field produced no response. However, when plants with extensive root-rot were transferred to sand culture and supplied with a full nutrient solution they recovered completely. The possibility that a nematode may be responsible is now being investigated. Among other diseases, leaf spot (*Mycosphaerella fragariae*) was controlled better by zineb at 2 lb./100 gal. than by bordeaux, captan, thiram, ziram or phenyl mercury chloride, the last of which was phytotoxic.

Disturbances of nutrition or of unknown origin.

(*See also* 3597m, 3598b, m.)

3460. BEYERS, E.
Trace element nutrition in deciduous orchards and vineyards.
Fmg S. Afr., 1956, **32**: 33-8, 41, bibl. 9, illus.
Trace element sprays for 1956.
Dec. Fruit Gr, 1956, **6**: 74-6, illus.

The author briefly reviews the knowledge gained under South African conditions of nutrient deficiencies, and gives revised spray schedules for their correction. The most widespread nutrient deficiencies in South Africa are those of zinc and manganese, but copper, iron and magnesium deficiencies are also discussed.—W.P. Fruit Res. Stat.

3461. MCCLUNG, A. C., AND CLAYTON, C. N.
Boron in relation to foliar and fruiting abnormalities of peach.
Plant Dis. Reptr, 1956, **40**: 542-8, bibl. 14, illus.

Symptoms of dwarfing, excessive branching, reduced fruit set and yield, and internal necrosis in fruits in peach have been related to low boron levels in leaves and twigs.—N. Carolina St. College, Raleigh.

3462. Cibes, H. R., Hernandez, E., and Childers, N. F.
Boron toxicity induced in a New Jersey peach orchard. Part I.
Proc. Amer. Soc. hort. Sci., 1955, **66**: 13-20, bibl. 12, illus.

Symptoms of B toxicity were induced in peach trees on a sandy loam by soil and foliage applications of B totalling $\frac{3}{4}$ lb. borax over a period of 2 years. Varietal differences in susceptibility to B injury were noted. Symptoms of toxicity consisted of withering and dying back of terminal shoots, small canker areas on the shoots accompanied by gumming, rough bark, prominent lenticels, swelling in the region of the buds and excessive development of lateral shoots. Flower bud formation and fruit set were reduced, particularly on trees receiving no Mn or Cu. Flower buds opened about a week later than in the controls and fruit maturity was hastened by 1–3 weeks. Fruit was flat and insipid and fruit from trees receiving excess B but no Cu showed many split pits. Yields were appreciably reduced. Leaf analyses indicated an antagonism between B and Mn.—Rutgers Univ., N.J.

3463. Barnes, M. M., and Jones, W. W.
Boron deficiency of grapes.
Calif. Agric., 1956, **10**(8): 12, illus.

Insufficient boron at the time of budding out results in abnormal growth of vines. Leaf symptoms are described. After early pruning growth is more likely to be abnormal. Soil applications of borax following early pruning resulted in growth being almost normal. Leaf analysis of treated vines showed a B level of 78·5 p.p.m. while leaves from untreated vines contained 23 p.p.m. B.

3464. Ono, T., and Yoshida, K.
Boron deficiencies of grapevines. (1.) [Japanese, with English summary $\frac{1}{2}$ p.]
J. hort. Ass. Japan, 1956, **25**: 35-48, bibl. 26, illus.

A 4-year study of B deficiency in vines was carried out in Japanese commercial vineyards. Typical symptoms were (1) persistence and browning of the calyx at anthesis, (2) low vigour of pollen, (3) greatly reduced fruit setting, (4) development of small seedless berries, (5) leaf mottling. In severe cases vines showed leaf burn, short internodes and die-back. *Phylloxera* and *Rosellinia necatrix* were common on roots of affected vines. Symptoms were enhanced by drought during the flowering period and were generally severe where excess of lime or K was present in the soil. Foliar B decreased during flowering, the critical level being 12–13 p.p.m. (dry weight). In affected leaves the contents of B, Ca, K and N were lower and the Ca : B and K : B ratios 2 to 3 times higher than in normal leaves. The critical level of available soil B was 0·2–0·3 p.p.m. There was no difference in pH value between deficient and normal vineyards.

3465. Kester, D. E., Brown, J. G., and Aldrich, T.
Copper deficiency of almonds.
Calif. Agric., 1956, **10**(6): 13, 16, illus.

Poor growth and a rough bark condition was observed in almond trees. Later the leaves showed symptoms of copper deficiency and a certain amount of kernel shrivel occurred. Leaf applications of a copper chelate and soil applications of copper sulphate resulted in improved shoot growth and leaf colour, and corrected kernel shrivel.

3466. Smith, R. L., and Neher, D. D.
Chelates offer promise in control of chlorosis.
Fm Home Sci., 1956, **17**: 8-10, 24, illus.

Chelates for use on alkaline soils have been tested in Utah. Applications of 400 g. of DTPA–Fe per peach tree corrected severe chlorosis. Young Elberta trees planted in a test plot which induced chlorosis grew normally after applications at planting of 120 g. DTPA–Fe, 30 g. APCA–Fe, or 34·4 g. CDTA–Fe. Severely chlorotic rose bushes were given 1 teaspoonful of chelate per bush; those treated with DTPA–Fe, APCA–Fe and CDTA–Fe showed almost complete recovery within 6 weeks. Other ornamentals which have responded to chelate application include peonies, petunias, irises, gladioli and woody plants.

3467. Bould, C.
The use of iron chelates for the control of lime-induced chlorosis in fruit: progress report II.
A.R. Long Ashton agric. hort. Res. Stat. for 1955, 1956, pp. 87-92, bibl. 6.

Results of field trials on small, very chlorotic pear trees show the possibility of achieving a temporary control of lime-induced chlorosis by soil dressings [a subsoil injection] of some iron chelates—especially Fe–HEEDTA —if they are transported to the roots within a comparatively short time. Such practices are of doubtful economic value. Foliage sprays are less expensive and 3 to 4 such applications at concentrations not exceeding 0·1% (plus wetting agent) will give a seasonal commercial control in deciduous fruits. Such sprays must thoroughly wet the leaves; they should therefore be applied before fungicidal or insecticidal sprays, otherwise the deposits of the latter may be washed off. Again Fe–HEEDTA proved the best of 6 foliage sprays tried.

3468. Ahmed, M. B., and Tewfik, M.
Treatment of iron chlorosis in young pear trees.
Curr. Sci., 1956, **25**: 192.

Chlorosis of young Le Conte pear trees was successfully corrected by a spray containing 1% manganese sulphate, 0·5% ferrous sulphate and a wetter, applied every 1 or 2 months from April till September.—Cairo Univ., and Minist. Agric., Cairo.

3469. Rodríguez, C., and Abadía, A.
Enraizamiento de membrilleros en relación con la deficiencia inducida de hierro. **(Rooting of quince cuttings in relation to iron deficiency.)** [English summary 2 lines.]
Anal. Edaf., 1956, **15**: 161-6, illus.

The rooting capacity of cuttings of 8 quince varieties was tested in 1954 at the Aula Dei Experimental Station, Zaragoza, Spain, in 9 replications of 20 cuttings each in a calcareous soil subject to iron deficiency. It was found that varieties most resistant to chlorosis at Zaragoza showed the lowest rooting capacity and those least resistant the highest. Angers gave 69% rooting, Quince A 61%, Quince C 59%, Fontenay 26% and Provence 16%.

3470. Bergman, E. L., and Kenworthy, A. L.
Molybdenum deficiency and nitrate toxicity on Concord grapes.
Quart. Bull. Mich. agric. Exp. Stat., 1956, **38**: 524-7, bibl. 6, illus.

Rooted vine cuttings were grown in nutrient solutions with several nutrient levels. Molybdenum deficiency expressed itself as chlorosis in the terminal leaves and as nitrate toxicity in the lower leaves. Ammonia and urea applications corrected these symptoms.

3471. Alben, A. O.
Preliminary results of treating rosetted pecan trees with chelated zinc.
Proc. Amer. Soc. hort. Sci., 1955, **66**: 28-30, bibl. 5.

Chelated zinc (Zn EDTA) was applied in solution to the soil under Zn-deficient pecan trees at 5 locations. Rates of ½, 1 or 2 lb. per tree were used. On acid, sandy loams the 2 higher concentrations corrected deficiency symptoms within about a year. On silt soils or soils with a more basic reaction the results were much less satisfactory.—U.S. Dep. Agric., agric. Res. Serv., Shreveport, La.

3472. Harrison, T. B.
The effect of some remedial treatments on young peach tree growth in replant orchards, 1954 and 1955.
From abstr. in *Agric. Inst. Rev.*, 1956, **11**(3): 35.

The effects on peach tree growth of remedial treatments applied before, at, and after planting 1-year-old budded peach trees in old peach orchards were studied. The use of "starter" solutions high in available P (10–52–17 and 10–30–10) was consistently effective in stimulating peach growth in both years of the trials. Manure as a mulch stimulated growth in a dry year. BHC applied at planting and subsequently at monthly intervals was beneficial in both seasons. Results with ammonium nitrate solution given at planting were favourable in one orchard, but the treatment was superfluous or injurious elsewhere. Soil steaming before planting resulted in no evident improvement in growth.—Dep. Agric., Harrow.

3473. Ward, G. M., and Durkee, A. B.
The peach replant problem in Ontario. III. Amygdalin content of peach tree tissues.
Canad. J. Bot., 1956, **34**: 419-22, bibl. 4.

The nature of the peach replant problem and the role of toxic substances, notably the cyanogenetic glycoside amygdalin, produced in the decomposition of peach root residues have been discussed in earlier papers [*H.A.*, 26: 1522 and 1523]. The amygdalin content has now been determined in the roots, branches, leaves and buds of peach seedlings and trees. The content ranged from nil in woody tissues to more than 50 mg./g. dry matter in some roots. The highest concentration occurred in the bark of the roots. Amygdalin contents varied considerably between varieties and in different seasons.—Chem. Div., Sci. Serv., Canada Dep. Agric., Ottawa.

3474. Moser, L.
Über die Rebmüdigkeit. **(On vine soil sickness.)** [English, French and Spanish summaries ¼ p. each.]
Mitt. Klosterneuburg, Ser. A, 1956, **6**: 97-107.

Field experiments showed that soil sickness appears earliest in closely-planted vineyards and on light soils. Planting at 1 m. square delayed the appearance of soil sickness symptoms. Soil exhaustion after European vines was different from that after American vines and the latter could safely be planted after the former. The early occurrence of soil sickness in nurseries may be due to infection by rotting root remains. When grafted vines are planted in sick soil scion rooting takes place and the rootstock dies. Shallow-rooting stocks should be planted after deep-rooting stocks. Dry seasons delay recovery from soil sickness. Pot experiments with rooted bud cuttings have given several promising results. Soil sterilization with CS_2 or DD gave some control of sickness, but the effect was of short duration; potassium permanganate and hydrogen peroxide also resulted in improved growth. Zinc was the only microelement to give a noticeable improvement in growth. Mixing sick soil with 20% or 40% clay also improved growth. Soil sown with lucerne, gherkin, sugar beet, carrots or mallow produced better vine growth. Sap from vines showing sickness did not infect healthy vines or soil. Nematodes have been found on roots of both healthy and diseased vines.

3475. Kerr, E. A., Dickson, G. H., and Willison, R. S.
The nature of certain leaf abnormalities in sweet cherry.
From abstr. in *Agric. Inst. Rev.*, 1956, **11**(3): 35.

Some leaves of Hedelfingen and Black Tartarian cherries may develop mottling and become crinkled. The symptoms were not transmitted by grafting. Selections 35016 (Hedelfingen × Black Tartarian) and 35024 (Hedelfingen × Bing) were sib-pollinated and a further generation of the compatible crosses grown. Most of the progenies contained many seedlings with the Hedelfingen type of crinkle, but one cross did not produce any abnormal seedlings. The possibility that the abnormalities are caused by a seed-transmitted virus is thus disproved.—Canada Dep. Agric., St. Catherines.

Climatic factors.

(*See also* 3245, 3249, 3264, 3442, 3598d.)

3476. Manaresi, A.
I danni del freddo nel '56 en nel '29 in Emilia e Romagna. **(Frost injury in Emilia and Romagna in 1929 and 1956.)**
Fruttic.,* 1956, **18**: 213-24, illus.

1929 and 1956 were both characterized by prolonged frosts in January/February. Notes are given for both years on frost injury to vines, fruit trees and nut trees and on varietal resistance.

* Formerly *Riv. Fruttic.*

3477. LOEWEL, E. L., AND KARNATZ, H.
Untersuchungen über die Frostresistenz der Obstgehölze im Baumschulstadium. **(Studies on the frost resistance of fruit trees in the nursery stage.)**
Züchter, 1956, **26**: 117-20, bibl. 13, illus.

A description is given of a mobile refrigerating plant which is capable of freezing nursery stock *in situ*. Tests in progress at Jork include apple, pear, plum and cherry seedlings, apple clones, apple, pear and cherry stem-builders and apple varieties worked on clonal rootstocks.

3478. KARNATZ, H.
Untersuchungen über die Frostresistenz der Obstgehölze im Baumschulstadium. II. Über die relative Frosthärte unveredelter Pflaumensämlings- und Kirschunterlagen. **(Research on frost resistance of fruit trees in the nursery . II. The relative hardiness of unworked plum seedling and cherry rootstocks.)**
Züchter, 1956, **26**: 178-87, bibl. 9, illus.

Freezing trials during 3 successive winters showed that the progeny from 3 single myrobalan trees were more frost resistant than stocks of the *domestica* group. Among 7 myrobalan progeny, 3 were relatively hardy, 2 were less hardy and 2 were frost susceptible. With cherry rootstocks seedlings of *Prunus mahaleb* were hardier than the *P. avium* group. Hüttner 170 was the most resistant of the *P. avium* group.—Obstb-Versuchsanst., Jork.

3479. STANKOVIĆ, D., AND BULATOVIĆ, S.
Prilog poznavanju osetljivosti nekih sorti bresaka, kajsija i krušaka prema zimskim mrazevima. **(A contribution to the study of the susceptibility of different peach, apricot and pear varieties to winter frosts.)** [English summary ½ p.]
Zasht. Bilja, 1955, No. 30, pp. 71-7, bibl. 16.

The frost damage sustained by peach, apricot and pear trees during the very severe winter of 1953/54 was studied at 5 localities in Serbia. The flower buds of apricot were found to be somewhat more susceptible than those of peach. Of peaches Red Bird, Morettini I, Mayflower, Wheeler, Amsden, Elberta, River's Early and Miss Lola were the most resistant and J. H. Hale, Early Hale, Waddell and Triumph the most susceptible, with up to 53·6% damaged buds. Tabulated data show that the most susceptible apricot variety had 71% and the most susceptible pear 48% damaged buds.

3480. ANGUS, D. E.
Spring frost damage to vines.
Aust. J. agric. Res., 1956, **7**: 163-8, illus.

Detailed temperature measurements among grapevines, and in the inversion layer in the air overhead, are presented for two nights in September on which frost damage occurred. The temperatures are related to the varying degrees of damage suffered by the vines. It is concluded that the critical vine-shoot temperature was about 28·5° F. at the stage of development of the vines at the time of observation. The air temperature at the height of the vines was about 1° F. higher. [Author's summary.]—Div. meteor. Physics, C.S.I.R.O., Melbourne.

3481. CLAYPOOL, L. L., AND ESAU, P.
Frost damage to walnut kernels.
Calif. Agric., 1956, **10**(6): 7, 16, illus.

Low temperature during harvest may damage walnut kernels. The meat becomes oily in appearance and the kernel becomes rancid. The freezing point of walnuts is directly related to moisture content, and when the moisture content is above 25% the kernels will freeze at about 28° F. The freezing point was lowered as the moisture content was reduced, and no freezing occurred at 10° F. when the moisture content fell below 12%. Supercooling without freezing does not damage the kernel and occurs when a low dew point and dry ground retard freezing. Other conditions favouring kernel freezing are a radiation frost and partial defoliation.

3482. BROOKS, F. A., AND LEONARD, A. S.
Temperatures and frost damage.
Calif. Agric., 1956, **10**(8): 7-8, 13.

Some local variations in frost occurrence and protection are summarized from studies in North California deciduous orchards. Preliminary tests with an experimental model of a ramjet-rotor wind machine gave encouraging results. The machine is driven by ramjets mounted on the tips of its propellor, and is thus roughly equivalent to the more conventional wind machine with heater support.

3483. DAVISON, J. R.
Orchard heating—prevention of frost damage in orchards and vineyards of the Murrumbidgee Irrigation Areas.
Agric. Gaz. N.S.W., 1956, **67**: 76-81, 148-57, illus.

The principles of frost occurrence are discussed. Cultural practices help to minimize the danger of frost damage. Oil-burning heaters are an economical means of avoiding frost damage to deciduous fruits during fruit set. A locally-designed wind machine (a compromise between a horizontal and a vertical fan) has shown promise in combatting winter frosts in citrus orchards.

3484. PESSI, Y.
The use of fog and smoke in frost defence. [Finnish summary ¼ p.]
Maataloust. Aikakausk., 1956, **28**: 50-7, bibl. 12.

Fogs generated by sulphur trioxide, water vapour or a combination of both were tested for frost protection over a 3-year period at the Frost Research Station, Pelsonsuo, in Finland. Effective outgoing radiation was only reduced by a comparatively small amount. Owing to their low efficiency and the high costs and labour problems involved, the author does not consider that artificial fogs are of much value in practice. As a possible development, however, in the fog method of frost protection, he suggests the generation of a type of fog which would eventually descend on the plants, thus combining the effective protection of sprinkler irrigation with a method that could be used over extensive areas.

3485. ZUCHKOV, N. R.
Méthodes de protection des vergers contre le gel hivernal. **(Methods of protecting orchards from winter injury.)**
Fruit belge, 1956, **24**: 97-104.

This is a French translation of a paper given by a leading Russian horticultural worker at a recent conference at Skiernewice in Poland. He details and discusses five practices observed with success in U.S.S.R. 1. The use of hardy varieties. Notes are given on introductions from Siberia. 2. Top grafting "tender" scions on to particularly resistant stocks—he enumerates the stocks. 3. Evading the rigours of local climatic conditions by training low. 4. Making the climate more favourable by wind breaks, artificial lakes, draining, planting closely, ridging. 5. Ensuring that the trees are prepared for the winter by proper nutrition and ripening off of wood. These are counsels of perfection but the writer does suggest intelligently how they can in certain measure be followed.

3486. GMÜR, V.
Frostberegnungsanlage "Mühleweg", Schleitheim. **(Frost irrigation scheme "Mühleweg", Schleitheim.)**
Schweiz. Z. Obst- u. Weinb., 1956, **65**: 370-4, illus.

The layout is described of a system of sprinklers which has been set up in a steeply-sloping vineyard for irrigation and frost-protection. Rotary sprinklers of the Perrot-Langsamregner LKA-30 type are used. A triangular arrangement of the sprinklers is necessary to obtain complete coverage; the communicating pipes are set along the contours when possible, at least 2 m. above the soil.

3487. SOKOLOV, V. M.
When to prune frost damaged fruit trees. [Russian.]
TUPICYN, D. I.
Restoration of frost damaged orchards. [Russian.]
HATIPOV, Š. E., AND HATIPOV, A. E.
Frost damage to fruit trees and pruning. [Russian.]
BULGAKOV, M. V.
Summer pruning of frost damaged fruit trees. [Russian.]
Sad i Ogorod, 1956, No. 7, pp. 50-3, illus.; 53-6, illus.; 56-8; and 58-9, illus. respectively.

Accounts of winter injuries sustained by apple, pear, plum and some other fruit trees and descriptions of methods of pruning the injured trees in the Krasnodar region, Central Asia, and the Samarkand and Sverdlov districts respectively.

3488. BLOMMAERT, K. L. J.
Winter dormancy and delayed foliation.
Dec. Fruit Gr, 1956, **6**: 77, 83.

With a view to finding some method of counteracting the effect of insufficient cold on deciduous fruit trees, a study has been made of the hormones and growth inhibitors concerned with growth and dormancy of peach buds. Results gained so far suggest that adequate cold during winter may be responsible for the destruction of the growth inhibitor.—W.P. Fruit Res. Stat.
J.R.L.

3489. DE VILLIERS, G. D. B.
The effect of summer climate on apricot production.
Sci. Bull. Dep. Agric. S. Afr. **363**, 1956, pp. 14, bibl. 11, illus.

In Western Cape Province the mild winters sometimes cause delayed foliation in apricot trees. The most important climatic factor, however, which seems to be responsible for annual fluctuations in apricot yield is high daily temperatures without adequate rainfall from January to March. Irrigation results in improved yields per tree.

3490. HAYASHI, S., AND WAKISAKA, I.
Studies on water-logging injury of fruit trees from the viewpoint of soil chemistry. [Japanese, with English summary ½ p.]
J. hort. Ass. Japan, 1956, **25**: 59-68, bibl. 26, illus.

In water-logged soils the Eh_6 values which resulted in arrested growth were 360–370 mv. for fig, 330–350 mv. for peach, 260–280 mv. for pear and apple, 200 mv. for persimmon and 170–180 mv. for vine. Root systems of fig and peach were affected mainly by oxygen deficiency before abundant formation of $Fe^{\cdot\cdot}$ occurred in the soil, but those of pear and apple were inhibited by the high content of $Fe^{\cdot\cdot}$ in the soil. Root injury by water-logging was enhanced by a high organic-matter content of the soil. Submersion tolerance was related to the root's resistance to $Fe^{\cdot\cdot}$ and H_2S. Resistance to injury from water-logging probably depended on the oxidizing capacity of the root.

Viruses.

(*See also* 3459, 3597c-e, j, k, p, t, 3598e, k, n.)

3491. (MULDER, D., AND MEIJNEKE, C. A. R.)
Second symposium on virus diseases of fruit trees in Europe, August 23–27, 1955, Wageningen, Netherlands.
Tijdschr. PlZiekt., 1956, **62**: 33-88, bibls, illus.

This part of the journal is comprised of papers read at the symposium. The papers included are: Unusual features of some New Zealand fruit tree viruses, by J. D. Atkinson; Flat limb of apple trees, by H. R. Kristensen; Rough skin of apples, by W. van Katwijk; The leaf roll virus disease of sweet cherry, by A. F. Posnette; "Stecklenberger disease", a previously unknown virus disease of sour cherry [German], by G. Baumann; A serious plum virus in Yugoslavia [French with English summary], by M. Yossifovitch; Observations on degeneration of apricots in France [French with English summary], by G. Morvan, J. Souty and R. Bernhard; Virus symptoms on almond leaves in southern Italy, by G. Scaramuzzi; The present aspect of fruit tree virus diseases in Switzerland, by S. Blumer; Recent progress in fruit tree virus research in Italy, by R. Ciferri; Observations on degenerative diseases of fruit trees [German], by H. Thiem; A new method suggested for breeding fruit trees resistant to virus diseases, by D. Stanković; and An indexing scheme in the Netherlands, by C. A. R. Meijneke.

3492. BROADFOOT, H., AND CONNER, E. C.
Control of "twist" in the Gravenstein apple.
Agric. Gaz. N.S.W., 1956, **67**: 180-8, illus.

"Twist" is the Australian name for flat limb and is a serious problem with Gravenstein in N.S.W. Trials have shown that it is transmitted during propagation but that symptoms may be induced in clean wood by stock incompatibility. Depth of planting has also affected symptom expression, symptoms being less common in deep-planted trees which scion-root readily. The author does not think that twisting is caused by a virus. Control of the phenomenon may be obtained by selection of clean wood and by inducing scion rooting as soon as possible. There are indications that by root-grafting scions on to their own roots healthy trees may result.

3493. LUCKWILL, L. C.
Virus diseases of fruit trees. V. Experiments on rubbery wood, mosaic and flat limb of apples.
A.R. Long Ashton agric. hort. Res. Stat. for 1955, 1956, pp. 51-7, bibl. 4, illus.

When rubbery wood infection of the wood was only partial the virus content of the small stocks was higher than that of the large stocks selected from the same clone. Whereas stock size itself apparently did not affect the weight of 2-year-old trees, rubbery wood infection reduced the average tree weight by 39%. Rubbery wood proved graft-transmissible between Lord Lambourne and James Grieve and *vice-versa*. Ellison's Orange, Rival, Tydeman's Late Cox, Grenadier, Sweet Coppin and Ashton Brown Jersey were found to act as symptomless carriers of the vein banding strain of apple mosaic. It is suggested that the condition previously known as flat-limb in Lord Lambourne could more suitably be termed "oval limb" in contradistinction to "flat limb" symptoms found in Gravenstein and graft transmissible to Lord Lambourne. [For previous reports see *H.A.*, 20: 2494 and 25: 291.]

3494. MEZZETTI, A.
La zebratura concentrica o anulatura concentrica delle mele. **(Concentric striping or ringing in apples.)**
Fruttic.,* 1956, **18**: 249-53, bibl. 4, illus.

An abnormality observed in Abbondanza apples in a Ferrara orchard in 1955 is described and illustrated. It is characterized by concentric brown rings or stripes centred on a lenticel or on the calyx or pedicel, resembles both Henderson spot (ring-spot, thumb mark) and B deficiency and is thought to be due to a virus complex. —Ist. Pat. veg. Univ. Bologna.

3495. STACE-SMITH, R.
Studies on *Rubus* virus diseases in British Columbia. III. Separation of components of raspberry mosaic.
Canad. J. Bot., 1956, **34**: 435-42, bibl. 14, illus.

It has been shown that the mosaic disease of red raspberry is the result of multiple infection by two separate viruses. Since these viruses, rubus yellow-net and black raspberry necrosis [see *H.A.*, 26: 1548 and 1549], have a common vector, the aphid *Amphorophora rubi* Kalt., and are both non-persistent, they are usually transmitted together and the complex nature of the mosaic disease can best be demonstrated by synthesis. [Author's abstract.]—Plant Path. Lab., Sci. Serv., Canada Dep. Agric., Vancouver.

3496. BECKER, R. F., AND RICH, A. E.
Effect of viruses on plant production and yield of strawberries in New Hampshire.
From abstr. in *Phytopathology*, 1956, **46**: 240.

Virus-free plants of 3 strawberry varieties produced up to about double the number of runners produced by local plants of the same varieties, and in the following year the virus-free clones produced up to about 2½ times the yield of the local clones.

Bacteria.

(*See also* 3597i.)

3497. CROSSE, J. E.
Bacterial canker of stone-fruits. II. Leaf scar infection of cherry.
J. hort. Sci., 1956, **31**: 212-24, bibl. 20, illus.

Experiments confirmed that infection of branches in the autumn by *Pseudomonas mors-prunorum* takes place through leaf scars.—E. Malling Res. Stat., Kent. [For part I see *H.A.*, 25: 2629.]

3498. BACHELDER, S., DAINES, R. H., AND BARTLEY, C. E.
Effect of nutrition on the incidence of bacterial spot of peach.
From abstr. in *Phytopathology*, 1956, **46**: 240.

In 3 years' trials peach bacterial spot (*Xanthomonas pruni*) infection was significantly less in high-P trees than in high-N trees each year, and was significantly more in high-N trees than in high-K and control trees in 2 years. Excessive N appears to increase slightly the susceptibility of the fruit.

3499. MILLER, P. W.
Preliminary comparison of Agri-mycin 100 and copper compounds for the control of walnut blight in Oregon.
Plant Dis. Reptr, 1956, **40**: 626-7, bibl. 7.

Agrimycin sprays compared favourably with 2 copper formulations used in control experiments for walnut blight (*Xanthomonas juglandis*). Agrimycin 100 at 25 p.p.m. was used and was effective under mild disease conditions. No foliage injury was caused.—U.S.D.A., Corvallis, Oregon.

Fungi.

(*See also* 3398, 3457, 3459, 3553, 3597f, q, w, 3598l.)

3500. HEUBERGER, J. W., COMEGYS, W. R., AND ROMANKO, R. R.
Captan and zineb, used alone, in alternation, and in combination—and the control of apple diseases.
Plant Dis. Reptr, 1956, **40**: 467-77, bibl. 16.

Research on captan and zineb for the control of apple diseases has shown that captan possesses certain advantages over zineb, particularly for scab control and fruit finish; contrariwise, zineb possesses certain advantages over captan, particularly for sooty blotch, rust and, possibly, fire blight control. Neither material used alone was completely satisfactory as an all-season spray. A combination of captan and zineb (half-strength of each) gave control of all the diseases present, was non-injurious, produced fruit having the highest finish, and resulted in residues well under the established tolerances for both captan and zineb. The alternating schedule of captan and zineb was equal to the combination of the two, except possibly for fruit finish. [Authors' abstract.]—Delaware agric. Exp. Stat.

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* Formerly *Riv. Fruttic.*

3501. Kirkham, D. S., and Flood, A. E.
Inhibition of *Venturia* spp. of analogues of host metabolites.
Nature, 1956, **178**: 422, 423, bibl. 3.

When the authors tested the effect of chlorogenic acid, caffeic, ferulic, protocatechuic, *p* and *o* coumaric, quinic and cinnamic acid on sporulation and growth of apple scab (*Venturia inaequalis*) spores on culture medium, cinnamic acid proved the most inhibitory compound and was unique in preventing germination of the inoculum. Further, when shoots of Cox's Orange Pippin were inoculated with *V. inaequalis*, and 24 hours later all but controls were injected with 0·2% solution of sodium cinnamate, only slight interveinal chlorosis and growth inhibition resulted, while 13 days after inoculation these shoots showed a high degree of inhibition of the fungus. Further studies are in progress.

3502. Byrde, R. J. W., Clarke, G. M., and Harper, C. W.
Spraying experiments against apple scab at Long Ashton, 1955.
A.R. Long Ashton agric. hort. Res. Stat. for 1955, 1956, pp. 140-5, bibl. 3.

In the dry summer of 1955, the second year of a three-year trial, an excellent control of apple scab (caused by *Venturia inaequalis*) on the variety Cox's Orange Pippin was afforded by post-blossom applications of either captan (0·075%) or lime sulphur (0·75%), following pre-blossom lime sulphur sprays. There were indications that the substitution of captan for lime sulphur in the post-blossom sprays resulted in a higher crop, with less fruit russet. The incidence of apple mildew (caused by *Podosphaera leucotricha*) on shoots of the current season's growth was markedly less on the plot receiving lime sulphur throughout both seasons 1954 and 1955. There was no evidence that the attack on other plots was sufficiently heavy to be of economic importance. [Authors' summary.]—For previous results see *H.A.*, 26: 375.

3503. Kearns, H. G. H., Marsh, R. W., and Morgan, N. G.
Spray application problems: XXVII. Field experiments in the control of apple and pear scab by small-volume sprays, 1955.
A.R. Long Ashton agric. hort. Res. Stat. for 1955, 1956, pp. 136-9, bibl. 4.

Small-volume air-flow sprays of lime sulphur and captan, at 30–35 gal. per acre, were used in field trials against apple and pear scab at Long Ashton in 1955. Unsatisfactory scab control was achieved by six applications of either 2% or 4% lime sulphur or 0·1% captan, at 55 gal. per acre per application, to 30-year-old bush trees of Cox and Worcester, having heads approximately 20 ft. in diameter. Excellent control of pear scab was obtained by six applications of 0·1% captan, at 30 gal. per acre, to William's pears grown in a modified "hedgerow" system in which the transverse diameter of the tree heads was approximately 5 ft. The better performance of the small-volume sprays on the pears is ascribed to the more suitable conformation of the trees for this type of application. [Authors' summary].

3504. Stobwasser, H., and Müller, G.
Freilanduntersuchungen über die Möglichkeit einer Bekämpfung von Obstschorf *Venturia inaequalis* und *Venturia pirina* und Rebenperonospora (*Plasmopara viticola*) mit Kondensationsnebel. **(Field trials on the possibility of controlling scab and vine downy mildew with aerosols.)** [English summary ½ p.]
Z. PflKrankh., 1956, **63**: 321-33, bibl. 6, illus.

Mist spray applications of captan, thiuram, flowers of sulphur and an organic Cu compound were made to apple and pear trees. Satisfactory control of *Venturia* was obtained with captan, thiuram and the copper sprays. Captan applications to a steep vineyard were satisfactory and *Plasmopara* infection was prevented, although coverage was not complete.

3505. Hainsworth, E.
Recent advances in scab control.
J. Sci. Food Agric., 1956, **7**(Suppl.): 117-19, bibl. 1.

The author reviews the present position of scab control in England, and considers that the Mills table* could be profitably introduced into this country. Captan, dithiocarbamates and organo-mercurial compounds have all given satisfactory control of scab, the problem now being to obtain control without harm to the tree and without increasing other diseases.

3506. Bush, R.
Spraying trials with captan against apple scab.
Agric. Rev., 1956, **2**: 38-40.

During the wet summers of 1954 and 1955 a captan spray programme gave excellent control of scab with no russeting on Cox on 2 commercial fruit farms in Suffolk and Hampshire. In Suffolk, however, where the rainfall was the lower, serious attacks of mildew developed. In Hampshire the captan programme did not result in mildew infection and yields were at least 50% higher than those previously obtained with a lime sulphur programme. The use of lime sulphur or mercury as pre-blossom sprays followed by post-blossom sprays of captan resulted in lower yields than a full captan programme.

3507. Stojanović, D., and Kostić, B.
Dejstvo kreozana na razvoj peritecija *Venturia inaequalis*. **(Effect of creosan on the development of perithecia of *Venturia inaequalis*.)** [English summary ½ p.]
Zasht. Bilja, 1955, No. 32, pp. 49-53, bibl. 5.

Leaf applications of 1–3% creosan (based on DNOC) resulted in abnormal perithecia and inhibited ascospore formation. Concentration and number of applications were not important factors, but timing was decisive in obtaining the maximum effect. The most favourable results were obtained by spraying before the formation of the asci, i.e. soon after leaf fall.—Inst. Plant Prot., Kragujevac. [See also abstr. 3581.]

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* See *Cornell Ext. Bull*, 640, 1944.

3508. Gorinova, Ju. V.
The value of eradicant spraying for the protection of vines from mildew and apples from scab. [Russian.]
Doklady vsesojuz. Akad. seljsk. Nauk, 1956, **21**(4): 15-20.

When selinon [DNOC] at 0·5% concentration or the homogenized preparation No. 47 at 2% concentration were sprayed on the ground in early spring and then the normal spray programmes applied, downy mildew incidence on vines and scab incidence on apples were much lower and the yields of both crops were considerably higher than when the normal spray programmes alone were used. It is suggested that by use of the combined spray programme it might be possible to reduce the number of cover sprays required. [See also abstr. 3581.]

3509. Savulescu, A., and others.
Einfluss der klimatischen Bedingungen auf die Bildung, das Auftreten und die Reifung der Perithecien von *Endostigme inaequalis* (Cooke) Sydow und auf das Ausschleudern der Ascosporen. **(The influence of climatic conditions on the formation, appearance and maturation of the perithecia of *Endostigme inaequalis* and on the discharge of ascospores.)**
Phytopath. Z., 1956, **26**: 333-76, bibl. 36.

Five years' observations on the biology of *Venturia inaequalis*, carried out in several fruit growing areas of Rumania, showed among other things that perithecia are formed at lower temperatures than stated in the literature, namely at a mean temperature in January and February of −3° C., with mean minima of −6° C. and mean maxima at +6° C. The following temperatures were found to be sufficient for the perithecia to reach maturity: Mean maxima for 1 month, 1–12° C.; mean temperatures, 1–6° C., often around 0° C. or even less; mean minima, short periods of −3° C. and −5° C. If the appearance of perithecia is delayed in January and February because of low temperatures, ascus ripening later on is also delayed. The conditions favouring spore discharge and infection are discussed in detail.—Inst. Cercetari agron., Bucharest.

3510. Keijer, E. J., and Dijksterhuis, H. P.
Bewaarziekten bij appels. De invloed van verschillende schurftbestrijdingsmiddelen. I. Onderzoek naar de oorzaken van stip. **(Storage diseases of apples. The effect of some materials for scab control. I. Studies on the cause of bitter pit.)** [English summary ½ p.]
Meded. Dir. Tuinb., 1956, **19**: 396-400, 406.

Sulphur, TMTD and organic mercury were sprayed on 11-year-old Notaris apple trees, and were found to have an indirect effect on the occurrence of bitter pit inasmuch as they resulted in reduced number of fruits per tree but increased fruit size. The addition of borax to the TMTD spray slightly reduced the occurrence of bitter pit when sprayed 10–30 days after flowering. Fruit from trees on M.II had less bitter pit than those on M.IV. Number of seeds per fruit was not related to occurrence of bitter pit.

3511. Brian, P. W., Elson, G. W., and Lowe, D.
Production of patulin in apple fruits by *Penicillium expansum.*
Nature, 1956, **178**: 263-4, bibl. 2.

Penicillium expansum was shown to produce patulin in apples under natural conditions, but the evidence suggests that the phytotoxic properties of the antibiotic are not responsible for the rot symptoms caused by the fungus. It is, however, thought possible that the production of such substances as patulin, fusaric acid and alternaric acid in plant tissues by fungal parasites may discourage secondary invaders.

3512. Baumeister, G.
Krebsschäden in Junganlagen. **(Canker injuries in young orchards.)**
Mitt. ObstbVersuchsringes Jork, 1956, **11**: 130-1, bibl. 5.

In recent years young apple trees growing on marsh land soils have been frequently subjected to a canker disease which tends to spread through the whole orchard. The causal fungus was identified provisionally as *Phomopsis mali*. Infection, which occurs through lenticels and frost-injured parts of the bark, seems to be favoured by the moist climate of the marsh land. The fruiting bodies of the fungus and the canker symptoms it causes are described.

3513. Smith, H. C.
Collar-rot and crown-rot of apple trees.
Orchard. N.Z., 1955, **28**(10): 16-17, 19-21, bibl. 5, illus.

Inoculation experiments with *Phytophthora cactorum* showed that susceptibility of Cox to collar-rot increased with age. Northern Spy was found to be moderately resistant to crown-rot. Laboratory tests showed that Merton 789, M.XV, M.XIII and Robusta were very susceptible to crown-rot. Most of the Malling-Merton rootstocks showed good resistance to collar-rot, except possibly 102, 109 and 113. Several strains of *Phytophthora cactorum* have been isolated. Soil infection was uniform at all distances between apple tree trunks. The control methods discussed are the use of resistant stocks and budding or grafting susceptible varieties high above ground level, and spraying trees or trunks with bordeaux mixture.—Plant Dis. Div., Lincoln, N.Z.

3514. Clayton, C. N.
Protect apples from powdery mildew.
Res. and Fmg, N.C., 1956, **14**(3/4): 3, illus.

Powdery mildew has increased in North Carolina orchards partly as a result of using organic fungicides and partly because of increased plantings of susceptible varieties. Recommended control measures are the removal of infected shoots and the application of a pre- and post-blossom spray programme based on sulphur, with and without ferbam, or lime-sulphur.

3515. Hunnam, D., Foulds, R. M., and Roney, E.
Trials with karathane for apple mildew.
Grower, 1956, **45**: 1375-6.

Karathane was applied for mildew control in orchards in Essex and Suffolk where captan was the main fungicide used in the spray programme. Four sprays, from the pink bud stage to 14 days after petal fall, reduced secondary infection in the same year and primary infection the following year. The addition of manoxol wetting agent increased the effectiveness of Karathane.

3516. PETTERSSON, S.
Karathane WD, ett nytt medel mot mjöldagg. **(Karathane, a new compound for mildew control.)**
Växtskyddsnotiser, 1956, No. 1-2, pp. 26-8, illus.

In comparative tests karathane, applied by itself or mixed with other fungicides, gave excellent control of the mildew diseases of apple, gooseberry, rose, *Viola cornuta* and chrysanthemum. Data of some of the trials are tabulated.

3517. BYRDE, R. J. W.
The varietal resistance of fruits to brown rot. I. Infection experiments with *Sclerotinia fructigena* Aderh. & Ruhl. on certain dessert, culinary and cider varieties of apple.
J. hort. Sci., 1956, **31**: 188-95, bibl. 22.

The culinary variety Edward VII showed significant resistance to the spread of the pathogen through the fruit from an established infection. The bitter-sweet cider varieties Yarlington Mill, Chisel Jersey and Dabinett showed resistance to infection of freshly made wounds by spores of the fungus. In an experiment comprising 20 varieties of apple, a correlation was found to exist between resistance of wounds to spore infection and the rate of browning of the cut surface. The possible significance of this result is discussed. [From author's summary.]—Long Ashton Res. Stat.

3518. SMITH, W. L., JR., HALLER, M. H., AND McCLURE, T. T.
Postharvest treatments for reduction of brown and *Rhizopus* rots of peaches.
Phytopathology, 1956, **46**: 261-4, bibl. 9.

Several materials were tested as postharvest treatments for the reduction of decay of peaches inoculated with spores of *Monilia fructicola* or of *Rhizopus stolonifer*. Sprays of Orthocide 50 Wettable and Isothan Q15 were equal to or more effective than sulphur dust in reducing brown rot but they were ineffective against *Rhizopus* rot. Tetrachloroethylene and trichloroethylene used as fumigants effectively reduced *Rhizopus* rot but were ineffective against brown rot. Dowicide A spray and a combination treatment of sulphur dust followed by fumigation with tetrachloroethylene effectively reduced both *Monilia* and *Rhizopus* rots. Mammalian toxicity of residues was not tested.—Plant Ind. Stat., Beltsville, Md.

3519. (BURGAUD, —.)
Les moyens modernes de lutte contre les ennemis du pêcher. **(Modern methods of controlling peach diseases and pests.)**
Arboric. fruit., 1956, No. 27, pp. 21-2.

At Limonest (Rhône), ziram applied to J. H. Hale peach trees when the buds were slightly swollen gave a high degree of control of peach leaf curl. The ziram spray could be combined with an oil-parathion spray which was effective against scales and red spider eggs.

3520. DE JONGE, C.
Bestrijding van het "rot" in kersen. **(Control of rot in cherries.)**
Fruitteelt, 1956, **46**: 533-4.

Treatment of cherries 14 and 8 days before picking with 0·25% TMTD or captan greatly reduced the percentages of rot (caused by *Botrytis cinerea*) and of cracking.

3521. HAMILTON, J. M., SZKOLNIK, M., AND SONDHEIMER, E.
Systemic control of cherry leaf-spot fungus by foliar sprays of actidione derivatives.
Science, 1956, **123**: 1175-6.

Actidione itself was recently shown [see *H.A.*, 23: 2830 and 24: 300 and 4483] to be highly specific against *Coccomyces hiemalis* both as protectant and eradicant. Greenhouse work at Cornell University, Geneva, now shows that some of its derivatives are equally or more active. Thus the oxime showed itself systemic in as much as, sprayed at 60 p.p.m. 2 to 3 weeks before inoculation with the fungus, it was taken up by foliage and translocated to new growth to which it provided protection against the fungus without serious injury to the new growth. At 40 p.p.m. the oxime inhibited further development of cedar-apple rust (*Gymnosporangium juniperi-virginianae*) in potted Rome Beauty apple trees. Moreover, the isomer, acetate and semicarbazone derivatives were protective against cherry leaf spot at 0·5 p.p.m. and gave good eradicative effect at 1 p.p.m. when applied 4 days after inoculation. The implications of these observations are briefly discussed.

3522. CLARKE, G. M., AND CORKE, A. T. K.
A rapid method of assessing black currant leaf spot.
A.R. Long Ashton agric. hort. Res. Stat. for 1955, 1956, pp. 196-200, bibl. 2, illus.

The method used was as follows: Visual estimates of the amount of *Pseudopeziza ribis* infection, expressed as the percentage leaf area affected on a whole bush, were made at intervals of three weeks starting with the appearance of leaf spot. The bushes to be assessed were compared with diagrams showing 5 levels of infection of a bush (10, 25, 50, 75 and 100%) superimposed on 6 levels of foliation (100, 80, 60, 40, 20 and 10%). The resulting diagrams showing the percentages of the total leaf area affected and unaffected by infection and defoliation were grouped into 6 categories, namely, 10, 25–28, 40–55, 60–75, 80–90 or 91–99% affected. The figures for percentage total leaf area affected were obtained by subtracting from 100 the percentage total leaf area remaining unaffected. This unaffected area is the product of percentage foliation and percentage existing leaf area uninfected. The intervals between adjacent categories were chosen to be of the minimum size easily distinguishable in the field, but still sufficiently small to yield good results. The method is shown to yield results of good precision detecting statistically quite small differences between differently treated groups of bushes.

3523. DOUGLAS, G.
This spray can increase next year's yield.
Grower, 1956, **45**: 1567-9, illus.

Three applications of 80% thiram given at 10-day intervals effectively controlled leaf spot (*Pseudopeziza ribis*) and leaf rust (*Cronartium ribicola*) on black currants. Spraying considerably increased the subsequent year's crop. Bushes bearing fruit for canning should not be sprayed until after picking, but other bushes may be sprayed as soon as the disease appears. —Fernhurst Res. Stat.

3524. Stadhouders, P. J.
De bladvalziekte der bessen. **(Leaf fall disease of currants.)**
Fruitteelt, 1956, **46**: 530, 535, illus.

Premature leaf-fall in currants is caused by *Pseudopeziza ribis*. Differences in varietal susceptibility are large in red currants; the Versailles group are very susceptible, whereas the Gondouin or Duitse-Zure group are hardly affected. The most commonly cultivated blackcurrant varieties are fairly susceptible to the disease. Effective control may be obtained by copper oxychloride or by ferbam. Applications should be made immediately after flowering and after picking.

3525. Hilborn, M. T., and Hyland, F.
Seek fungicide to control red leaf disease of blueberries.
Me Fm Res., 1956, 4(1): 21-3, illus.

The rapid spread of the red leaf disease of blueberries, *Exobasidium vaccinii*, in 1954 was shown to be due to the extremely wet growing season. Previously the disease was not considered serious as in a normal season the spores are produced during the July dry weather and do not germinate. In view of the danger of the fungus spreading in wet seasons, and until a fungicidal control method is found, the authors recommend eliminating diseased plants by spot spraying them with kerosene oil emulsion. J.R.L.

3526. Varney, E. H.
Protectant sprays and eradicant ground treatments for control of mummy berry of blueberry, 1955.
[*Proc.*] *24th annu. Blueberry Open House*, N.J. agric Exp. Stat., 1956, pp. 11-16, bibl. 2.

Mid-April foliage applications of dichlone, micronized wettable sulphur, zineb or maneb, gave satisfactory protection from mummy berry diseases [*Monilinia vaccinii corymbosi*]. One application of a dinitro compound or calcium cyanamide was effective as an eradicant ground spray; it should be applied at the appearance of the first mummy cup and before bud burst.

3527. Stoddard, E. M., and Miller, P. M.
Control of gray mold on strawberries under greenhouse conditions.
Plant Dis. Reptr, 1956, **40**: 443-5, bibl. 6.

Thiram and dichlone gave good control of grey mould (*Botrytis cinerea*) on glasshouse strawberries for 18 days after spraying. Thioneb, Mesulfane and Norsulfane at the higher concentrations (3 lb. per 100 gal.) gave good control for 10 days. Captan gave moderate control for 10 days, but nabam, ziram and Puratized 1180 were unsatisfactory.—Conn. agric. Exp. Stat., Newhaven.

3528. Douglas, G.
Trials with spray treatment for botrytis.
Grower, 1956, **45**: 1378.

In trials for *Botrytis cinerea* control on strawberries the best results were obtained by 4 applications of spray at 10-day intervals starting at early open blossom. Captan, salicylanilide and zineb have shown promise as either dusts or sprays, but the best results were obtained with an 80% thiram spray formulation. None of these sprays should be used on fruit destined for canning.—Fernhurst Res. Stat.

3529. Lowings, P. H.
The fungal contamination of Kentish strawberry fruits in 1955.
Reprinted from *Appl. Microbiol.*, 1956, **4**: 84-8, bibl. 7, illus.

An investigation was carried out to determine the identity of the fungal hyphae contaminating strawberry fruits harvested in mid-Kent during 1955. In freshly picked fruit the most common hyphae were generally those of *Sphaerotheca humuli* which, together with *Botrytis cinerea* and *Mucor piriformis*, contributed 98 to 99·5% of the total hyphae both in fresh and stored fruit. *M. piriformis* was, in this season, the most important cause of rotting during storage, with *B. cinerea* contributing in a secondary capacity. *Cladosporium herbarum*, *Penicillium* spp., and *Trichoderma viride* were almost ubiquitous on the senescent styles and stigmas adhering to the fruit, but the proportion of hyphae attributable to these species was insignificant. The most common organism in plate counts was the yeast *Kloeckera apiculata* which caused slow breakdown when inoculated into wounded, surface sterilized fruits. The significance of figures obtained by the Howard mold count technique is discussed in the light of these results. A small scale investigation of substances suitable for application to harvested strawberries showed peracetic acid to be a promising agent for the control of mold development during short periods of storage. [Author's summary.]—Ditton Lab., D.S.I.R., Larkfield, Kent.

3530. Schmidle, A.
Phytophthora cactorum (Leb. et Cohn) Schroet. als Schaderreger an Früchten der Erdbeere. **(*Phytophthora cactorum* as a pathogen of strawberry fruits.)**
Phytopath. Z., 1956, **26**: 449-56, bibl. 14, illus.

A rot of strawberry fruits occurring at Heidelberg in 1955 was shown to be due to *Phytophthora cactorum*. The symptoms, which are described, differ from those reported in other countries for leathery rot which is caused by the same fungus. Spreading of straw under the fruits is recommended for the prevention of the trouble. The biology of the fungus is discussed.—Biol. Bundesanst., Inst. Obstbau, Heidelberg.

3531. Vaughan, E. K., and others.
The Oregon Strawberry Plant Propagation Center.
Plant Dis. Reptr, 1956, **40**: 322-4, bibl. 5, illus.
Vaughan, E. K.
A method for eliminating the red-stele fungus from valuable strawberry stocks.
Phytopathology, 1956, **46**: 235-6, illus.

Both papers describe a new method of producing plants free from red core (*Phytophthora fragariae*). The runners are not permitted to come into contact with the soil in which the infected mother plant is growing but are led away to root in separate flats. The fungus does not invade the runners and the runner plants are free from infection. The first paper also gives information about the Center which was inaugurated in 1954 for the production of certified disease-free strawberry plants.

3532. Wilhelm, S., and Koch, E. C.
Verticillium wilt controlled.
Calif. Agric., 1956, **10**(6): 3, 14, illus.

Verticillium-infected soil was fumigated with chloropicrin by injection at the rate of 3 ml. per sq. ft., before planting with strawberries. During the first growing season 0·45% of the plants in the fumigated area became infected; infection averaged 11·3% in the untreated area exclusive of patches of nearly complete failure. The second-year yield from the fumigated area was 16·7 tons and from the control plots 7·6 tons.

3533. Harvey, J. M.
Post-harvest decay studies with fresh figs.
Proc. 10th annu. Res. Conf. Calif. Fig Inst., 1956, pp. 27-9.

There is considerable loss of fresh figs during marketing chiefly due to surface spotting and decay caused by species of *Cladosporium* and *Alternaria*. Refrigeration at 31 to 30° F. holds the decay in check but is not satisfactory for more than 10 days. In some tests a mixture of ethylene dichloride and trichlorethane gave very significant decay control. Dowicide A. peracetic acid, captan, sodium bisulphite and sorbic acid used as fungicidal dips all reduced the amount of decay. Treatments were more effective in reducing decay in early than in late crops. The picking box is a source of fungal contamination and it is suggested that the paper liner should be changed after use. J.R.L.

3534. Wilson, E. E.
Experiments with branch wilt of walnut.
Proc. 10th annu. Res. Conf. Calif. Fig Inst., 1956, pp. 24-5.

Branch wilt (*Hendersonula toruloidea*) attacks English walnuts and figs. The fungus enters the tree through cracks in the bark that are usually caused by sunburning, and the leaves on the infected branches suddenly wither; the infected wood is discoloured. A tree provided with adequate N and water is less liable to attack, and infections can be reduced by two winter applications of bordeaux mixture (10 : 10 : 100). All infected branches should be removed. J.R.L.

3535. Moser, L.
Bericht über die Peronospora-Bekämpfungsversuche im Jahre 1955. **(Report on *Peronospora* control experiments in 1955.)** [Short German, English, French and Spanish summaries.]
Mitt. Klosterneuburg, Ser. A, 1956, **6**: 173-6.

Organic fungicides gave good control of *Peronospora*; there was no indication that the sprayed grapes were more susceptible to rot. The 2 final sprays, however, should be copper, red copper compounds being recommended for vine-nurseries and copper sulphate for vineyards.

3536. Lupetti Belviglieri, R.
Osservazioni sull'impiego degli acuprici in provincia di Verona. Anno 1955. **(Notes on the use of non-copper fungicides in the province of Verona, 1955.)**
Riv. Vitic. Enol., 1956, **9**: 77-90.

An account is given of 12 trials in which zineb (Aspor) and bordeaux mixture were compared for the control of downy mildew (*Plasmopara viticola*) on a range of vine varieties. All plots were treated with wettable sulphur against powdery mildew (*Uncinula necator*). Zineb gave good control of downy mildew, advanced flowering and maturity but not defoliation, improved fruitset but not yield or quality, and resulted in earlier growth flush, greater vigour and more rapid healing of hail injuries. It had a shorter residual effect and some downy mildew was observed on the zineb-treated plants at the time of the last spray application. There was more powdery mildew on the plants treated with zineb than on those treated with bordeaux.

3537. Miller, P. W., and Roth, L. F.
Relative susceptibility of potted seedlings of *Juglans regia, J. hindsii* and *Pterocarya stenoptera* to *Phytophthora cinnamomi.*
Plant Dis. Reptr, 1956, **40**: 538-41, bibl. 5, illus.

Inoculation tests with *Phytophthora cinnamomi* were carried out with 3 walnut rootstocks. Potted seedlings of *Juglans regia* and *J. hindsii* were found to be susceptible, while *Pterocarya stenoptera* did not become infected.—Oregon St. College.

Nematodes.

(*See also* 4260.)

3538. Oostenbrink, M.
Over de invloed van verschillende gewassen op de vermeerdering van en de schade door *Pratylenchus pratensis* en *Pratylenchus penetrans* (*Vermes, Nematoda*), met vermelding van een afwijkend moeheidsverschijnsel bij houtige gewassen. **(The influence of different crops on reproduction of and injury by *Pratylenchus pratensis* and *P. penetrans*, with a record of an unidentified sickness in woody perennials.)** [English summary pp. 2.]
Tijdschr. PlZiekt., 1956, **62**: 189-203, bibl. 13, illus.

In tests with 11 crop plants nematode populations in the soil were relatively low after woody plants. A type of sickness which appeared to be unconnected with *Pratylenchus* infestation occurred in rose and apple after 2 years of continuous culture.

3539. Foster, H. H., and Baxter, L. W.
Studies on control of peach root knot with Nemagon in South Carolina.
Plant Dis. Reptr, 1956, **40**: 400-2, bibl. 3, illus.

Nemagon was injected into the soil round living peach trees. Satisfactory *Meloidogyne* control without any check to tree growth was obtained with treatments of 5 and 8 gal. of Nemagon per acre.—S.C. agric. Exp. Stat., Clemson.

Mites.

(*See also* 3457, 3598s.)

3540. Kearns, H. G. H., Morgan, N. G., and Wilkins, A. H.
Spray application problems: XXV. The application of chlorbenside and chlorfensone for the control of the winter eggs of the red spider mite (*Metatetranychus ulmi*, Koch).
A.R. Long Ashton agric. hort. Res. Stat. for 1955, 1956, pp. 125, 126.

It was found that 0·02% chlorbenside as a dispersible powder or benzolemulsion without a wetting agent gave a 99% kill of winter eggs of the red spider mite provided it was applied just before egg hatch.

3541. Cranham, J. E.
Control of red spider on fruit.
J. Sci. Food Agric., 1956, 7(Suppl.): 93-101, bibl. 18.

Recent developments in the chemical control of red spider mites are reviewed. Chlorbenside has been used effectively against winter eggs and immature mites of *Metatetranychus ulmi*. Observations on the control of summer infestations of red spider suggest that activity with chlorbenside and other chemicals is not limited to direct kill of eggs and larvae, and the use of the term "ovicide" is considered inadequate when applied to this type of compound.

3542. Wilcox, J., and Howland, A. F.
Experiments on the control of the two-spotted spider mite on strawberries.
J. econ. Ent., 1956, **49**: 242-4.

In tests for the control of *Tetranychus telarius* on strawberries in southern California from 1951 to 1954, consistently good results were obtained with demeton, ovex and Aramite. Materials inconsistent or comparatively ineffective in most experiments were oil emulsions, schradan, malathion, parathion, Sulphenone, Compound 876, Chlorobenzilate, sulfur, dinitrobutylphenol, DMC, Metacide, TEPP, NPD and karathane. Materials showing promise in 1954 but requiring further testing were Diazinon, Holcomb compound 326, the methyl analog of demeton, schradan and Rohn & Haas FW-152 and FW-293. Aramite spray concentrates caused some blackening of the upper leaf surfaces, but this is not considered serious. The dinitrobutylphenol caused severe leaf burn, and a spray concentrate of FW-152 caused slight marginal leaf burn. [From authors' summary.]—Agric. Res. Serv., U.S.D.A.

3543. Müller, H. W. K.
Zum Auftreten und zur Bekämpfung der Erdbeermilbe. (**Occurrence and control of strawberry mite.**)
NachrBl. dtsch. PflSchDienst., Braunschweig, 1956, **8**: 65-9, bibl. 4, illus.

Observations on the effect of microclimate on strawberry mite (*Tarsonemus pallidus*) are recorded. Mite control was most satisfactory with an endrin emulsion [see also *H.A.*, 26: 2963], and application is recommended after harvest or by dipping the young plants before planting. The ovicidal acaricides tested had insufficient penetration to be effective. A chlorinated Inden preparation and a lindane-dieldrin combination showed promising control.—Staatsinst. angew. Bot., Hamburg.

3544. Michelbacher, A. E.
Spider mites on walnuts.
Calif. Agric., 1956, **10**(7): 4, 14.

Recent increases in European red mite [*Paratetranychus pilosus*] populations are associated with increased OMPA treatments. FW-293 (containing 1,1-bis (chlorophenyl) trichloroethanol) applications were highly effective against red mite populations. OMPA applied in the spring to control walnut aphid [*Chromaphis juglandicola*] has given excellent control of Pacific spider mite [*Tetranychus pacificus*].

Insect pests.

(*See also* 3238, 3597b, h, n, 3598a, i, p, t-v, 4263, 4273.)

3545. Williams, E. L.
Control of fruit pests other than red spider.
J. Sci. Food Agric., 1956, 7(Suppl.): 103-8.

Among the pests considered in this review are aphis, codling moth, apple sawfly, pear sucker, cherry fruit moth, raspberry cane midge, blackcurrant sawfly and leaf curling midge, and ground beetles in strawberries. A summary of control measures is tabulated.

3546. Asquith, D.
Information derived from experiments in the control of apple pests.
St. hort. Ass. Pa News, 1956, **35**: 52-6.

The author gives guidance to growers for correct spray selection by reference to results of control experiments on codling moth and red spider mite. A new acaricide F.W.293 (trichloromethyl 1-4,4′-dichlorobenzhydrol) has given excellent summer control of *Tetranychus* and *Metatetranychus*.

3547. Whitcomb, W. D.
The grape cane girdler.
Bull. Univ. Mass. Coll. Agric. **484**, 1956, pp. 22, bibl. 4, illus.

The life history of and damage caused by the grape cane girdler (*Ampeloglypter ater*) in eastern Massachusetts is described. Summer pruning of infested canes reduced infestation, but spraying was more satisfactory. DDT, lead arsenate, lindane and methoxychlor have given satisfactory protection, but a general formulation containing methoxychlor, malathion and captan was the most effective spray. Applications should be made in late May and early June, and repeated at intervals of 4–9 days according to conditions.

3548. Peretz, I., and Avigdorov, A.
Experiments on the control of the tropical fig borer in Israel.
Plant Prot. Bull. FAO, 1956, **4**: 132-5, bibl. 1.

Young larvae of the tropical fig borer, *Batocera rufomaculata*, destroy the bark and phloem of the lower part of the trunk of fig trees and the older larvae bore large tunnels in the wood. In some parts of Israel more than 50% of the trees have been killed. The best control was obtained when the bark areas under which the young larvae feed were painted with a plastic wax preparation containing parathion (2·5% active ingredient). Lindane was also effective but injured the bark. Demeton, diazinon, dieldrin and malathion were tested in the laboratory but were not so effective. After the larvae are in the wood they can be killed by injecting benzine into the burrows, but this is recommended only as a complementary treatment.—Div. Plant Prot., Minist. Agric., Jaffa. J.R.L.

3549. Smith, E. H., Grainger, M. M., and Avens, A. W.
Parathion, EPN, dieldrin and methoxychlor for control of the plum curculio on prunes.
J. econ. Ent., 1956, **49**: 14-18, bibl. 3.

Results of several seasons' field tests show dieldrin to be the most effective material for plum curculio control on prunes, followed by EPN, methoxychlor and parathion. In laboratory studies, supplementing the field tests, the residual action, toxicity to stages present when treatments are customarily applied and contact toxicity of the insecticides were evaluated.—N.Y. St. agric. Exp. Stat., Geneva.

3550. Michelbacher, A. E.
Navel orangeworm on walnuts.
Calif. Agric., 1956, **10**(6): 8, illus.

Infestations of navel orangeworm [*Myelois venipars*] can be caused by the population overwintering on the previous crop's waste left lying in the field. Codling moth infested nuts are often attacked, and sprays for control of this pest also reduce navel orangeworm infestation. Other preventive methods are early harvesting and good sanitation.

3551. Klingler, J.
Zur Bekämpfung des gefurchten Dickmaulrüsslers. **(The control of the vine weevil *Otiorrhynchus sulcatus*.)**
Schweiz. Z. Obst-u. Weinb., 1956, **65**: 406-12.

In trials at Jenins and Maienfeld parathion, diazinon and malathion treatments proved ineffective. Promise is shown by dieldrin, aldrin and similar preparations which are now being tested. Success has been gained by the application of DDT 0·25% dust to the shoots and main stem of the vine at the right time, namely immediately after the emergence of the adult beetles. This should be followed by a second application 4 to 5 weeks later. The advantages of an additional DDT liquid application to the shoots are now being tested.

3552. Lazarević, B.
Biologija u suzbijanje višnjevog svrdlaša. **(Biology and control of *Rhynchites auratus* Scop.)** [English summary 2 pp.]
Zasht. Bilja, 1955, No. 30, pp. 11-36, bibl. 9, illus.

R. auratus is a serious pest of sweet and sour cherries, in particular of the latter, and also attacks plums and apricots. The damage caused, mainly by the adults, to flower- and leaf-buds and later to young fruits is described and illustrated. Satisfactory control was obtained on sour cherries by spraying with a 1% emulsion of Pantakan (16·5% DDT) or a 0·5% emulsion of 33% DDT at the time the fruits set. When the infestation is very heavy an additional pre-blossom application of either material may be necessary.

3553. Willison, R. S., and Dustan, G. G.
Fruit flies and fungal wastage in peaches.
Canad. J. agric. Sci., 1956, **36**: 233-40, bibl. 1.

Investigations covering 3 harvests show that fruit-fly (*Drosophila* spp.) infestations nearly always enhance wastage caused by brown rot (*Monolinia* [*Sclerotinia*] *fructicola*) and by black mould (*Rhizopus nigricans*) in peaches held in boxes for more than 3 or 4 days while awaiting shipment to canneries. Spraying the trees with sulphur gave better control of brown rot, but less effective control of black mould, than spraying with captan. Sulphur also seemed to exert a repellent effect on the flies.—Sci. Serv., Canada Dep. Agric., Ottawa.

3554. Zocchi, R.
Gli insegnamenti della lotta contro i tripaneidi dei fruttiferi in esperienze eseguite in Emilia e Toscana nel 1955. **(Knowledge gained on control of tripaneids of fruit trees in experiments cprried out in Emilia and Tuscany in 1955.)**
Riv. Ortoflorofruttic. ital., 1956, **40**: 156-65.

Spraying at 10-day intervals with a 5% sugar solution containing lead arsenate gave good control of *Rhagoletis cerasi* in cherry orchards, except in the case of one late variety grown with earlier ones. Equal degrees of control of *Ceratitis capitata* in peach orchards were given by 2 series of spray treatments: (1) as above, (2) with 1% suspension of 50%-active DDT. Bottle traps containing 3·5% ammonium diphosphate used with (1) showed very heavy captures. At the peak of infestation the average percentages of sound fruit were 0·6 from untreated and 20·2 from treated trees. With early and late varieties control was slightly higher. Two equally effective spray treatments against the same fly in persimmon orchards were: (1) DDT as above, mixed with 0·1% phosphoric ester containing 20% parathion; (2) 0·15% phosphoric ester with 50%-active malathion and 20% parathion. Treated trees produced 93–95% of sound fruit and untreated trees 85%.

3555. Mitić-Mužina, N.
Efikasnost nekih sredstava u suzbijanju trešnjine muve. **(The effectiveness of some insecticides for cherry fruit fly control.)** [English summary ⅓ p.]
Zasht. Bilja, 1955, No. 30, pp. 49-53, bibl. 7.

Results of the experiments described show that it is possible to control cherry fruit fly, *Rhagoletis cerasi*, on cherries grown on small plots or in individual orchards. Of the materials used, i.e. DDT, parathion, diazinon and their compounds, a mixture of E605 forte (0·05%) and Gesarol 50 (0·2%) was found to be the best. E605 forte alone and diazinon were also effective.

3556. Michelbacher, A. E., and Sisson, R. L.
The walnut husk fly.
Calif. Agric., 1956, **10**(5): 13.

The walnut husk fly, *Rhagoletis completa*, had not previously been reported from northern California. The maggots feed in the nuts, reducing the internal content of the husks to a "soupy black mixture" that seriously stains the shell of the nut. The nuts of the black walnut seem to be preferred to those of the English walnut. Spraying the soil beneath the trees with endrin (6 lb. per acre) was apparently very toxic to the flies when they emerged from the soil. J.R.L.

3557. Savary, A.
Les noctuelles dans le vignoble de Suisse romande. **(Noctuids in the vineyards of French-speaking Switzerland.)**
Rev. romande Agric. Vitic., 1956, **12**: 57-60, bibl. 3, illus.

The biology of *Agrotis* spp. which are found in vineyards near Lausanne is described. Some indication of parasitism has been found. Tests have shown that effective control for at least 12 days may be obtained by DDT sprays applied in May to the vine and a small area of soil around the stem.—Stat. féd. Essais agric., Lausanne.

3558. Summers, F. M.
The peach twig borer.
Circ. Calif. agric. Ext. Serv. **449**, 1955, pp. 16, illus.

Larvae of the borer (*Anarsia lineatella*) attack twigs and fruit of peach, plum, almond and apricot in California. Directions are given for the use of basic lead arsenate, DDT and parathion sprays.

3559. Sorenson, C. J., and Gunnell, F. H.
Biology and control of the peach twig borer (*Anarsia lineatella* Zeller) in Utah.
Bull. Utah agric. Exp. Stat. **379**, 1955, pp. 19, bibl. 16, illus.

The peach twig borer is a serious pest of peach, apricot and nectarine orchards, and also occurs on pear, plum and prune. It damages buds, new growth and fruit. There are three generations each year in Utah. Experiments showed that the best control is obtained by spraying with lime sulphur at the delayed dormant stage and with basic lead arsenate just before the second brood emerge. Dormant oil sprays and DDT applied later both gave significantly inferior control. J.R.L.

3560. Wallace, L. E.
Control of the raspberry root borer.
J. econ. Ent., 1956, **49**: 287.

Experiments over 2 seasons have shown that the raspberry root borer, *Bembecia marginata*, is only poorly controlled by chlordane, but can be moderately controlled by DDT and completely controlled by parathion. J.R.L.

3561. Hough, W. S., and Hill, C. H.
Outbreak of leaf miner on apple and its control.
J. econ. Ent., 1956, **49**: 217-19, bibl. 3.
Hill, C. H.
Newer insect pests and their control.
St. hort. Ass. Pa News, 1956, **35**: 56-9.

Outbreaks of the unspotted tentiform leaf miner, *Callisto geminatella*, occurred in Virginia in 1954 and 1955. Parathion, malathion, BHC, dieldrin, TDE, DDT and nicotine sulphate effectively destroyed the moths but only parathion gave a good control of the larvae in the mines. Nicotine sulphate killed young larvae in the mines, and Systox and Am. Cyanamid 3911 also showed promise as larvacides.—Va agric. Exp. Stat., Winchester. J.R.L.

3562. Regragui, B.
La pyrale des fruits (*Cryptoblabes gnidella* Mill.). **(The fruit pyralis, *Cryptoblabes gnidella*.)**
Terre maroc., 1956, **30**: 181-6, illus.

The larvae of this moth are a serious pest of vines in the hot, humid districts of Morocco. They live in association with *Pseudococcus citri*, so control measures must be directed against both pests. Preliminary control trials indicated that the loose bark should be removed from the vines at the beginning of the dormant period and sprays of anthracene or white oil plus a thiophosphoric ester applied, the spray being repeated a few days before bud burst. The fruit should be dusted or sprayed with DDT 3 times at monthly intervals from the beginning of the ripening period.

3563. Marucci, P. E.
Cherry fruitworm and blueberry maggot control.
[*Proc.*] *24th annu. Blueberry Open House*, N.J. agric Exp. Stat., 1956, pp. 7-11.

Parathion continued to give good control of cherry fruitworm [*Grapholitha packardi*]. Two sprays of malathion, or a combined spray of malathion and DDT were rather less effective. Malathion sprays reduced the count of blueberry maggot [*Rhagoletis pomonella*] in the fruits, results being improved by the addition of a bait. In laboratory tests both parathion and malathion gave good control of maggots in the berries. Malathion sprays applied commercially were more effective than rotenone sprays.

3564. B., M.
Une nouvelle forme de dégâts sur pommes. **(A new type of damage on apples.)**
Rev. romande Agric. Vitic., 1956, **12**: 60, bibl. 1, illus.

Damage caused by larvae of the tortrix moth *Pamene rhediella* to immature apples is described. The point of entry into the fruit is often surrounded by superficial bite marks; the tunnels are generally made in the direction of the stalk and the frass is pushed to the outside. Where infestation is serious the time of the first codling moth spray should be advanced.

3565. Jackaja, G.
Cherry sawfly and means of control. [Russian.]
Sad i Ogorod, 1956, No. 5, pp. 62-3, illus.

Satisfactory control was obtained of *Neurotoma nemoralis* on sour cherries by the following treatments. Early in the spring, before bud burst, 12% BHC dust was applied as a precautionary measure. Later, during the egg laying period, a 5–6% water suspension of 5% DDT was applied and towards the end of petal fall the trees were dusted with 5% DDT.

3566. Čolič, M.
Trešnjina osa listarica štetočina koštunjavih voćaka u hercegovini. **(*Neurotoma nemoralis* L. a pest of stone-fruits in Hercegovina.)** [English summary ½ p.]
Zasht. Bilja, 1955, No. 30, pp. 63-9, bibl. 4, illus.

In recent years *N. nemoralis* has caused damage in some parts of Hercegovina, especially to cherry trees. In control trials in the spring of 1954 best results were obtained by spraying with 1% emulsion of 33% DDT.

3567. Mijušković, M.
Ogledi suzbijanja smokvinog mediča u nr crnoj gori. **(Experiments to control the fig ceroplast.)** [French summary ¼ p.]
Zasht. Bilja, 1955, No. 32, pp. 43-7, bibl. 6, illus.

Ceroplastes rusci was most successfully controlled by a spray of parathion at 0·03% or white oil at 1·5% applied when the larvae were on the leaves. Winter sprays based on DNOC also gave good results.—Inst. agric. Res., Titograd.

Other pests.

(*See also* 3598j, r.)

3568. Goos, U.
Beobachtungen an in Maschendraht gepflanzten Apfelbüschen. **(Observations on bush apples planted in wire-netting.)**
Mitt. ObstbVersuchsringes Jork, 1956, **11**: 103-5, illus.

Root damage by the black water-rat was prevented for at least 3 seasons by enclosing the roots of young apple trees in small-mesh wire netting at planting time.

3569. Mehl, S.
Entwicklung und Stand des Rattenproblems in Westdeutschland bis zum Jahre 1956. **(Rat control: progress and present position in West Germany 1956.)** [English summary 14 lines.]
Z. PflKrankh., 1956, **63**: 449-74, bibl. 71.

A well documented account of progress made shows that the anti-coagulant coumarin poisons have the great advantage that their use does not result in rats being deterred from taking the bait once the first rats have taken it and been poisoned. Rat proofing of buildings is discussed.

3570. Horsfall, F., Jr.
Ground sprayed rodenticides.
St. hort. Ass. Pa News, 1956, **35**: 11-20, illus.

Screening of several rodenticides has shown that endrin is a promising material for orchard mouse control. Recommendations for ground application are given. [See also *H.A.*, 25: 1532 and 26: 1620 and 2670r.]

3571. Hildreth, A. C., and Brown, G. B.
Repellents to protect trees and shrubs from damage by rabbits.
Tech. Bull. U.S. Dep. Agric. **1134**, 1955, pp. 31, bibl. 91, illus.
Protecting trees and shrubs from rabbit damage.
Leafl. U.S. Dep. Agric. **396**, 1955, 1 folded sheet, illus.

During the last 22 years the Cheyenne Horticultural Field Station, Wyo., has screened over 130 materials and mixtures in different concentrations for repellency to rabbits. Most materials proved unsatisfactory; only 4 were found to combine non-toxicity to plants with the other necessary physical properties and satisfactory repellency. These were nicotine, nicotine sulphate, tetramethylthiuram disulphide and tetraethylthiuram monosulphide. In the leaflet advice is given on the preparation and application of these repellents.

3572. Halazon, G., and Herrick, E. H.
Controlling damage caused by animals.
Circ. Kans. agric. Exp. Stat. **328**, 1956, pp. 25, illus.

The food habits of a species may make them compete with man or livestock and when this occurs control measures should be directed towards decreasing the loss rather than eradicating a wildlife species. The general principles of such methods are discussed and specific measures, including traps, are listed for the control of pocket gophers, prairie dogs, ground squirrels, woodchucks, mice, rats, moles, rabbits, coyotes, skunks and a few birds. J.R.L.

3573. Przygodda, W.
Experiments on house sparrows (*Passer domesticus*) with two repellents, "Morkit" and "Morkit" conc. (VO 4279).
Höfchen-Briefe (English edition), 1955, **8**: 251-8, bibl. 9.

Successful results have been obtained with grain by dusting the growing crop with Morkit conc. Experiments by E. Schneider are also mentioned in which bullfinches were prevented from feeding on buds by spraying with Morkit, and starlings avoided treated, ripe red currants. Treated crops can be safely eaten.

3574. Olstad, O.
Kråka og trosteplagen. **(Crows and the thrush plague.)**
Frukt og Baer, 1956, **9**: 88-93, illus.

It is suggested that too severe destruction of crows has aggravated the nuisance from thrushes in Norwegian and small fruit plantations.

Materials and technique.

(*See also* 3310, 3457, 3597a, g, r, s, x, 3598c, f, h, o, w, 3916.)

3575. v. Rosen, A. S. H.
Några erfarenheter med nyare bekämpningsmedel mot skadedjur. **(Observations on some recent chemicals for pest control.)**
Växtskyddsnotiser, 1956, No. 1-2, pp. 11-20.

Observations on pest control made at the Swedish Plant Protection Institute, Stockholm, are discussed under the following headings: chemicals; the action of systemic insecticides; red spider and aphid control in the glasshouse; fruit tree red spider (with special reference to apple); aphids on fruit trees (with special reference to plum); laboratory trials with agricultural plants; effects of the chemicals on the plants.

3576. Clancy, D. W., and McAlister, H. J.
Selective pesticides as aids to biological control of apple pests.
J. econ. Ent., 1956, **49**: 196-202, bibl. 12.

Initial tests were conducted in a recently abandoned orchard in West Virginia in 1952 where natural enemies were more numerous than in sprayed orchards. The most promising materials were also tested as complete seasonal schedules in 3 commercial orchards in comparison with standard spray schedules. The fungicides glyodin and captan were found to be relatively harmless to predaceous mites of the genus *Typhlodromus*, which control the European red mite populations on unsprayed trees, but sulfur was highly toxic to them. Glyodin also showed an early-season [acaricidal] effect on the European red mite not possessed by captan. When DDT was used alone or in standard seasonal schedules in the abandoned orchard, predaceous mites were virtually eliminated and red mite infestations became much greater than on trees receiving any other treatment. Although DDT was very effective against codling moth in the 3 commercial orchards, its failure during all 3 seasons in the abandoned orchard suggests that this population may be partially resistant to DDT. A mixture of ryania and glyodin gave outstanding control of severe codling moth infestations in both the abandoned and commercial orchards, comparable to that usually obtained with DDT, but control was less satisfactory when captan was used instead of glyodin. The predaceous mites were unharmed by the pure ryania, but populations were seriously reduced by repeated applications of an activated product. [From authors' summary.]—Agric. Res. Serv., U.S.D.A.

3577. Wäckers, R. W.
Phytophysiological effect of the systemic insecticide "Systox" (diethyl thionophosphoric ester of β-oxyethyl thioethyl ether.)
Höfchen Briefe [English Ed.], 1955, **8**: 265-324, bibl. 92, illus.

Experiments were carried out to ascertain at what concentrations Systox [demeton] affected the physiological processes of the plant. Low and medium dosages (i.e. those normally used insecticidally) had no effect whatsoever. At a concentration $>0{\cdot}005\%$ the growth of cress roots was inhibited; comparative studies on *Lemna* roots suggest that this is primarily an inhibition of the division processes. With experiments on algae of various species it was found that: (1) 0·005% Systox and 0·014% Schradan decreased the dry weight production; (2) algae rich in fat (nitrogen deficient) stored more active ingredient than fat-free cells; (3) in solutions of Systox at concentrations $>0{\cdot}005\%$ there was a reversible increase of respiratory consumption of O_2 and production of CO_2 by algae which was not amplified by the addition of glucose to the solutions; there was also a depression of photosynthesis at these concentrations; (4) the syntheses which involve the incorporation of ammonium salts and nitrogen assimilation were inhibited in a 0·01% Systox solution. Field tests on *Vicia faba* showed that an increase in yield is not to be expected following an application of Systox, even if pest infestation is completely eliminated. J.R.L.

3578. Baldacci, E.
I nuovi prodotti acuprici nella lotta antiparassitaria. **(The new non-copper fungicides.)**
Reprinted from *Boll. Agric., Milano*, 8 Aprile 1955, No. 14, pp. 11.

In trials in Pavia in 1952/54 Aspor (zinc ethylene bisdithiocarbamate) gave good control of vine downy mildew (*Plasmopara viticola*) and was much more effective than bordeaux mixture.

3579. Taschenberg, E. F., and Shaulis, N.
Effects of DDT-bordeaux sprays and fertilizer programs on the growth and yield of Concord grapes.
Proc. Amer. Soc. hort. Sci., 1955, **66**: 201-8, bibl. 9, illus.

In a 6-year experiment a DDT-bordeaux spray programme reduced growth of Concord vines by about 20% and yields by about 10%, regardless of fertilizer treatment. The bordeaux constituent is believed to be responsible for the depressing effect of the spray.—N.Y. St. agric. Exp. Stat., Geneva.

3580. Schaffer, H. G.
Neat lime sulphur on black currants.
Grower, 1956, **45**: 1387, illus.

No toxicity to flowers or leaves of black currant bushes was observed after low-volume spraying with 3 gal. 100% lime sulphur and 6 pints DDT per acre, for control of big bud and leaf curling midge. The varieties sprayed were Seabrook's Hilltop, Baldwin and XXX.

3581. Poljakov, I. M.
New preparations for eradication spraying.
[Russian.]
Doklady vsesojus. Akad. seljsk. Nauk, 1956, **21**(3): 23-6.

To increase the effectiveness of control measures used against diseases and to reduce the number of cover sprays, at the same time replacing copper fungicides by non-copper fungicides, it is suggested that a strong disinfectant should be applied to the soil in the spring. Of materials tested preparation No. 125 containing nitro phenols obtained from shale was found to be the most suitable. In vineyards previously treated with preparation No. 125 and other similar materials bordeaux applications gave better downy mildew control and higher yields than in vineyards not previously treated with an eradicant spray. When, in the combined spray programme, the number of bordeaux applications was reduced from 5 to 4 or 3 the results were still satisfactory and it was possible to replace bordeaux with fuclasin or dinitrorodanbenzol. The eradicant sprays were also very effective in the control of American mildew on gooseberry, a *Septoria* sp. and anthracnose on currants, but for apple scab control they require further testing. [See also abstr. 3507 and 3508.]

3582. Somers, E.
The role of supplements in copper fungicide sprays.
A.R. Long Ashton agric. hort. Res. Stat. for 1955, 1956, pp. 111-15, bibl. 17.

The effects of supplements, stickers or wetting agents on the tenacity of copper fungicides and on the level of "run-off" deposits following fungicide application are discussed. [See also *H.A.*, 26: 2671u.]

3583. Srivastava, U. S., and Srivastava, P. D.
Soap as spreader and insecticide.
J. econ. Ent., 1956, **49**: 266-7, bibl. 5.

The minimum percentage of soap in water required for complete wetting of the leaves of 30 vegetable, fruit and other plants tested varied between 0·2 and 0·5. The percentage required for wetting by spraying was slightly higher than that needed by dipping. If used only as a spreader, soap in excess of 0·5% was superfluous. As an insecticide, tested against the aphid *Siphocoryne indo-brassicae*, a 4% soap solution was effective.—Dept. Zool., Univ. Allahabad, India.

3584. Handte, —.
Ein Beitrag zum Wirkstoffnebelverfahren.
(A report on low volume spraying.)
Dtsch. Gartenb., 1956, **3**: 134-6, illus.

Low volume sprays have given good control of brown tail, small ermine and codling moths in apple trees. Comparison of costs showed that low volume spraying was the most economical of the spray methods used.

3585. Bennett, S. H., and Furmidge, C. G. L.
Spray application problems: XXIV. The study of plant surfaces and spray deposits by means of transparent impressions.
A.R. Long Ashton agric. hort. Res. Stat. for 1955, 1956, pp. 121-4, bibl. 3, illus.

Simple methods of obtaining transparent impressions of plant surfaces in cellulose acetate and gelatin are described. The detail of such impressions, which can be examined microscopically or by projection, renders them very valuable in the study of the nature of plant surfaces. Some uses of the methods for the study of solid spray deposits, fungi and small animals on plants are described and illustrated. [Authors' summary.]

3586. Kearns, H. G. H., and Morgan, N. G.
Spray application problems: XXX. Mobile observation platforms for the examination of tree crops.
A.R. Long Ashton agric. hort. Res. Stat. for 1955, 1956, pp. 156-8, bibl. 1, illus.

Descriptions are given (1) of a modified hydraulic loader fitted to a Ferguson tractor for use in examining the tops of trees up to 18 ft. high, and (2) of an extending self-supporting ladder for trees up to 72 ft. high. The latter, obtained from Germany, was used for observation and sampling on coconut palms in Zanzibar and the Solomon Islands. Two operators can erect and lower the ladder, but on rough or uneven ground it needs a tractor or truck and a team of 6 men to move it into position.

3587. Claypool, L. L., and Vines, H. M.
Commodity tolerance studies of deciduous fruits to moist heat and fumigants.
Hilgardia, 1956, **24**: 297-355, bibl. 20, illus.

Studies were made of commodity tolerance of deciduous fruits—chiefly apples, apricots, peaches, plums, pears and persimmons—to various treatments designed as possible conditions for the movement of fruits across quarantine barriers set up for the Oriental and other fruit flies. Of the 16 chemicals tested the two showing greatest promise were ethylene dibromide and ethylene chlorobromide. The margin of safety between dosages of these two chemicals reported to give complete kill of all stages of certain fruit flies and dosages that damaged the fruit was much greater than with methyl bromide. Bromide residues remaining in treated fruits were small and these dissipated rapidly; they were thought to be of little concern to public health. [From authors' summary.]

3588. Barnes, D. F., and Reilly, G. W.
Farm fumigation of dried fruit.
Proc. 10th annu. Res. Conf. Calif. Fig Inst., 1956, pp. 20-22, illus.

Fumigation with methyl bromide at 2 lb. per 1,000 cu. ft. has been found to be the most practical method of controlling insect infestations in dried fruits. It destroys all stages of storage insects and any rodents present. A gas- and air-tight enclosure is described. It is made by erecting a framework of timber around the boxes of fruit and completely covering it with laminated kraft-type paper. The base is sealed by piling soil over the edge of the paper. The stacks should not be too large and should be built on a wood foundation to allow free circulation of gas. J.R.L.

3589. Goheen, A. C., McGrew, J. R., and Smith, J. B.
Tolerance of strawberry plants to hot-water therapy.
Plant Dis. Reptr, 1956, **40**: 446-51, bibl. 4, illus.

Strawberry plants dug when air temperatures were low and the plants were dormant, and immersed immediately in water at 127° F., withstood immersion for longer periods than plants dug in late fall or early spring. Storage at 32° F. for 2 weeks increased the hot-water tolerance of strawberry plants dug between early December and early March. Cold storage did not increase the hot-water tolerance of plants dug in late March after plant growth had started in the field. —Agric. Res. Serv., U.S.D.A.

Spray residues.

(*See also* 3597a, y.)

3590. Hammar, H. E.
Effect of spray residues and other contaminants on leaf analysis.
Plant Physiol., 1956, **31**: 256-7, bibl. 8.

Spray residues and other contaminents on pecan leaves were effectively reduced without leaching by washing with 1% HCl solutions. Nut-tree leaves generally carry enough Fe as surface dust contamination to affect the analysis for Fe. Residues of bordeaux, Ziram and zineb contain enough Cu and Zn to alter results of analysis for these elements.—Agric. Res. Serv., U.S.D.A., Shreveport, Louisiana.

3591. Watson, C. C.
Microdetermination of 2-(*p-tert*-butylphenoxy)-1-methylethyl 2-chloroethyl sulfite (Aramite) residues by sulfur dioxide evolution.
J. agric. Food Chem., 1956, **4**: 452-4, bibl. 9.

Residues found at harvest on apples sprayed with varying amounts of Aramite 15W (15% wettable powder) throughout the season are given.—D.S.I.R., N.Z.

3592. Ivančenko, A. V.
The effect of temperature on the residual toxicity of BHC. [Russian.]
Doklady vsesojuz. Akad. seljsk. Nauk, 1955, **20**(6): 26-8, bibl. 7.

In laboratory experiments γ-BHC vaporized 227 times faster at 55° C. than at 20° C. From these and other similar results it is concluded that in the southern regions of the U.S.S.R. long residual activity of BHC cannot be expected.

3593. Giang, P. A., Smith, F. F., and Hall, S. A.
Enzymatic estimation of dimethyl 2,2-dichlorovinyl phosphate spray residues.
J. agric. Food Chem., 1956, **4**: 621-2, bibl. 5.

Preliminary tests indicated that dimethyl 2,2-dichlorovinyl phosphate (DDVP) is effective against oriental fruit fly and melon fly in Hawaii. Residue determinations by the method described, which is sensitive to 0·5γ of DDVP, showed that DDVP residues virtually disappeared 72 hours after treatment. The plant materials analysed were guava, mango, avocado, grapefruit and orange fruits, and lima bean, coleus and lily plants dipped in a 0·1% solution of DDVP in aqueous alcohol and then dried.

3594. Ordas, E. P., Smith, V. C., and Meyer, C. F.
Spectrophotometric determination of heptachlor and technical chlordan on food and forage crops.
J. agric. Food Chem., 1956, **4**: 444-51, bibl. 10, illus.

Fruits and vegetables treated with recommended dosages of heptachlor and chlordan showed no significant residues at harvest.—Velsicol chem. Corp., Chicago.

3595. Barr, H. E., Clark, P. J., and Jacks, H.
Parathion spray residue on apples, beans, and quinces.
N.Z. J. Sci. Tech., Sect. B, 1956, **37**: 623-5, bibl. 4.

From experiments over several seasons the authors report that when apples were harvested 4½ to 6 weeks after the last parathion spray application the residue contained parathion not exceeding 0·18 p.p.m.; that bean samples harvested 7 days after the last application contained a mean residue of 0·10 p.p.m.; and that quinces harvested 10 days after the last application had up to 0·38 p.p.m. parathion. These residues are well below the safety limit of 1 p.p.m. J.R.L.

3596. Giang, P. A., and Smith, F. F.
Colorimetric determination of metaldehyde residues on plants.
J. agric. Food Chem., 1956, **4**: 623-5, bibl. 9.

Metaldehyde is applied for the control of slugs and snails infesting vegetable and flower gardens. The described colorimetric method, sensitive to 0·5γ of metaldehyde, was used for residue determinations on lima bean plants and geranium and chrysanthemum leaves. It was found that when a 15% metaldehyde dust was applied at 1 lb. per 1,000 sq. ft. in the greenhouse, on plants kept at temperatures of 37° to 44° C., the material almost completely disappeared in 24 to 48 hours, whereas on plants kept at 22° to 25° C. the chemical was still detectable after 20 days.

Noted.

3597.

a Anon.
1956 spray recommendations for tree fruits in Eastern Washington.
Ext. Bull. St. Coll. Wash. Ext. Serv. **419**, revised 1956, pp. 35, illus.
See *H.A.*, 24: 1299. This edition has additional information on residue limits for most insecticides and acaricides.

b Bennett, S. H.
An unusual attack on apples by a sawfly (*Ametastegia* sp.).
A.R. Long Ashton agric. hort. Res. Stat. for 1955, 1956, p. 120.

c Boek, K.
Verzögerter Austrieb und übermässiger Blütenbesatz der Süsskirsche durch Virus verursacht. **(Delayed foliation and excessive flowering in sweet cherries caused by virus.)**
Mitt. ObstbVersuchsringes Jork, 1956, **11**: 105-8, illus.

d Bovey, R., and Blumer, S.
Les principales maladies à virus des arbres fruitiers. **(The chief virus diseases of fruit trees.)**
Reprinted from *Journ. fruit. maraîch. d'Avignon, March 1955*, as [*Publ.*] *Minist. Agric. Fr.* **470**, 1955, pp. 14, bibl. 27, illus.
Symptoms, varietal susceptibility, rootstock influence and preventive measures.

e Bovey, R.
L'enroulement chlorotique, une nouvelle maladie à virus du pêcher. **(Chlorotic leafcurl, a new virus disease of peach.)**
Rev. romande Agric. Vitic., 1956, **12**: 42-3, bibl. 4, illus.
Symptoms of a peach disease observed in the Geneva district of Switzerland.

f Brebion, G.
Fongicides. Méthode d'évaluation directe, sur feuille de vigne isolée, de la valeur antifongique (mildiou ou oidium) de produits ou de préparations nouveaux. **(Fungicides. Direct method, using detached vine leaves, of estimating the value of new products and preparations for control of mildew or oidium.)**
Phytoma, 1955, 7(71): 7-10, from abstr. in *Fruits d'Outre Mer*, 1956, **11**(5), No. 1060.
The method fills a gap between laboratory and field trials.

g Butt, D. J.
Spray application problems: XXVI. The range of fungicidal action of micro-deposits of captan on artificial surfaces and on leaves.
A.R. Long Ashton agric. hort. Res. Stat. for 1955, 1956, pp. 127-35, bibl. 3.
Trials on pear leaves against pear scab.

h Clausen, C. P.
Biological control of fruit flies.
J. econ. Ent., 1956, **49**: 176-8, bibl. 9.
A review with special reference to work in Hawaii.

i Dye, D. W.
Suggestions for controlling blast of stone fruit.
Orchard. N.Z., 1956, **29**(4): 2-3.
Preliminary recommendations for growers.

j Frazier, N. W., and Posnette, A. F.
Leafhopper transmission of a clover virus causing green petal disease in strawberry.
Nature, 1956, **177**: 1040-1, bib. 2, illus.

k Fulton, R. H.
A study of virus diseases of strawberry in Michigan.
Diss. Abstr., 1956, **16**: 640, bibl. 1, being *Publ.* 15666 of 105 pp.

l Heyns, A. J., and others.
Full spray programme on the control of diseases, pests and trace element deficiencies of peaches 1956/57.
Suppl. to *Dec. Fruit Gr*, 1956, **6**(5), p. 1, illus.

m Holdsworth, L. W.
A note on new methods of treating trace element deficiencies in plants.
J. roy. hort. Soc., 1956, **81**: 318-21, bibl. 7.
Ion exchange resins, chelates and fritted trace elements.

n Huffaker, C. B.
Spread and activity of imported parasites of fig scale.
Proc. 10th annu. Res. Conf. Calif. Fig Inst., 1956, p. 23.
Aphytis "C" imported from France caused a marked reduction of scale population.

o Jacks, H., and others.
Orchard spray trials in 1954-55.
Supplement to *Orchard. N.Z.*, 1955, **28**(10), pp. 15.
Against diseases and pests of apples, diseases of peaches and quinces, and pests of grape vines and citrus.

p Jordović, M.
Kržljavost šljive virozna bolest u našoj zemlji. (**Prune dwarf, a new virus disease in Yugoslavia.**) [English summary 4 lines.]
Zasht. Bilja, 1955, No. 30, pp. 61-2, bibl. 4.
Observed on Italian prunes at Čačak in 1952.

q Jovićević, B.
Pepelnica na kruški. (***Phyllactinia suffulta* (Reb.) Sacc. (*Ph. corylea* (Pers.) Karst.) on pear trees.**) [English summary ¼ p.]
Zasht. Bilja, 1955, No. 30, pp. 37-9, bibl. 4, illus.
Conditions favouring infection.

r Kearns, H. G. H., and Morgan, N. G.
Spray application problems: XXVIII. A compressed air spray nozzle for laboratory and field equipment for small-volume airflow spraying.
A.R. Long Ashton agric. hort. Res. Stat. for 1955, 1956, pp. 146-50, illus.
Illustrations, photographic and diagrammatic, with explanations.

s Kearns, H. G. H., and Morgan, N. G.
Spray application problems: XXIX. A tractor driven airflow mist-blower for experimental work.
A.R. Long Ashton agric. hort. Res. Stat. for 1955, 1956, pp. 151-5, bibl. 3, illus.
Description and notes on operation.

t Kristensen, H. R.
Virussygdomme hos stenfrugttraeer. (**Virus diseases of stone fruit trees.**) [English summary ¾ p.]
Tidsskr. Planteavl, 1956, **60**: 69-166+8 plates, bibl. 154, illus.
Notes, based on the literature, on symptoms, transmission and control of 66 diseases.

u Lees, K. A.
Antibiotics in agriculture. Their rôle as potential crop protectants.
Reprinted from *Chem. and Drugg.*, 1956, **165**: 238-9, bibl. 28, illus.
A brief review.

v Loewel, E. L.
Vorschläge für die Schädlingsbekämpfung 1956 verbunden mit einem Spritztagebuch. (**Suggestions for disease and pest control for 1956 with a spray calendar.**)
[*Publ.*] *ObstbVersuchsringes Jork*, 1956, No. 25, pp. 34, illus.
For top and soft fruits.

w Malik, S. A.
Pomegranate fruit rot in Loralai Baluchistan, caused by *Zythia* sp.
From abstr. in *Proc. 6th Pakistan Sci. Conf., Karachi, 1954, Part III*, pp. 75-6, bibl.
Spraying trials were made but are not reported on here.

x Marsh, R. W.
Developments and uses of the newer agricultural fungicides and bactericides.
Plant Prot. Bull. FAO, 1956, **4**: 113-16, bibl. 1.

y Martin, J. T.
Spray application problems: XXI. The rapid assessment of deposits of copper fungicides. XXII. Determination of captan deposits: II. and XXIII. Determination of deposits of DDT, *gamma*-BHC and chlorbenside.
A.R. Long Ashton agric. hort. Res. Stat. for 1955, 1956, pp. 98-102, bibl. 5, 103-5, bibl. 1, 106-10, bibl. 10.
Methods and applications of methods described.

z Ministerie van Landbouw, The Hague.
Bescherming van nuttige vogels. (**Protection of useful birds.**)
Meded. PlZiekt. Dienst **17**, revised 1956, pp. 43, illus.
The provision of boxes and shrubs for nesting.

3598.

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Japanese beetle.
Adv. Leafl. Minist. Agric. Lond. **449**, 1955, pp. 4, illus.
Popillia japonica.

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Deficiencies of fruit crops.
[*Publ.*] *FATIS*, received 1956, 25 colour plates and text.
An English edition of work noted in *H.A.*, 24: 2401.

c NORDBY, A.
Nye erfaringer med tåkesprøyting. **(New observations on low-volume spraying.)**
Frukt og Baer, 1956, **9**: 11-25, bibl. 7, illus.
A preliminary report on experiments carried out by the Norwegian Institute of Agricultural Engineering.

d OVERCASH, J. P., AND CAMPBELL, J. A.
The effects of intermittent warm and cold periods on breaking the rest period of peach leaf buds.
Proc. Amer. Soc. hort. Sci., 1955, **66**: 87-92, bibl. 12, illus.
A fuller version of *H.A.*, 26: 2570.

e REEVES, E. L., AND CHENEY, P. W.
Foliage symptoms on sweet cherry infected with the little-cherry-type virus obtained from Kwanzan and Shiro-fugen oriental flowering cherries.
Plant Dis. Reptr, 1956, **40**: 408-9, illus.

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Insecticides and miticides.
[*Mimeo. Publ. Wyo.*] *agric. Ext. Serv.*, undated, pp. 15.
Notes on formulations, uses and toxicity of many new compounds.

g ROBB, T. R.
Insecticide dilution tables.
[*Mimeo. Publ.*] *Wyo. agric. Ext. Serv.*, undated, pp. 2.

h RUI, D.
Note fitosanitarie stagionali. **(Seasonal notes on plant protection.)**
Riv. Ortoflorofruttic. ital., 1956, **40**: 172-6, illus.
Insecticides and fungicides suitable for use in spring in Italian apple, pear, peach, cherry and olive orchards.

i RUI, D., AND GIRALDI, G.
La minatrice delle foglie di vite. **(The vine leaf miner.)**
Riv. Vitic. Enol., 1956, **9**: 67-70, illus.
Brief notes on *Antispila rivillei*, including control.

j SCHEFFER, T. H.
The mountain beaver.
Stats Circ. Wash. agric. Exp. Stats **262**, 1955, pp. 3, illus.
Trapping the tree-eating rodent *Aplodontia rufa.*

k SCHÖNIGER, G.
Erdbeervirosen in Deutschland. II. Isolierung nicht persistenter Viren aus einigen Kultursorten. **(Strawberry viruses in Germany. II. The isolation of non-persistent viruses from some cultivated varieties.)**
Phytopath. Z., 1956, **26**: 113-23, bibl. 5, illus.
Analysis of virus components isolated from the varieties Pillnitz, Hochgenuss von Erfurt and Selektion 6. [For Part I see *H.A.*, 26: 1550.]

l SLOTBOOM, H. J.
Het gloeosporiumrot en de bestrijding daarvan. **(*Gloeosporium* rot and its control.)**
Fruitteelt, 1956, **46**: 661, illus.
Markedly reduced by 9 applications of captan, TMTD or zinc-carbamate.

m SMOCK, R. M.
A promising new method of scald control.
Proc. N.Y. St. hort. Soc., 1956, pp. 102-4.
See *H.A.*, 26: 238.

n SOMMEREYNS, G.
Sur l'identification des viroses des arbres fruitiers par voie biochimique. **(The identification of fruit tree viruses by biochemical means.)**
Fruit belge, 1956, **24**: 81-7, bibl. 32.
Found impossible as yet.

o STAPLEY, J. H.
The application of sprays at low volume to fruit trees.
Agric. Rev., 1956, **2**: 28-31.
An appraisal of the present situation.

p STATENS FORSØGSVIRKSOMHED I PLANTEKULTUR.
Guldhalen. **(Brown-tail moth.)**
Medd. Forsøgsvirks. Plantekult. **314**, 2nd edition 1955, pp. 2, illus.
Control of *Euproctis chrysorrhoea* on fruit and ornamental trees.

q STATENS FORSØGSVIRKSOMHED I PLANTEKULTUR.
Sygdomme og skadedyr på hindbaer. **(Diseases and pests of raspberry.)**
Medd. Forsøgsvirks. Plantekult. **437**, 2nd edition 1955, pp. 4, illus.
Symptoms and control.

r TWINN, C. R.
Control of rats and mice.
Publ. Canada Dep. Agric. **972**, 1956, pp. 8, illus.
Preventive measures and control of *Rattus norvegicus* and *Mus musculus.*

s UNTERSTENHÖFER, G.
Contribution to the methods employed in carrying out tests to control the orchard mite *Paratetranychus pilosus.*
Höfchen-Briefe (English edition), 1955, **8**: 230-40, bibl. 8.

t U.S. DEPARTMENT OF AGRICULTURE.
The brown-tail moth, how we fight it.
Pamphl. U.S. Dep. Agric. **282**, 1956, 1 folded sheet, illus.
Including control of a fruit and shade tree pest, *Nygmia phaeorrhoea.*

u U.S. Department of Agriculture.
The gypsy moth, how we fight it.
Pamphl. U.S. Dep. Agric. **285**, 1956, 1 folded sheet, illus.
Porthetria dispar.

v U.S. Department of Agriculture.
The white-fringed beetle. How to control it with insecticides, how to prevent its spread.
Leafl. U.S. Dep. Agric. **401**, 1956, pp. 8, illus.
Larvae of *Graphognathus* spp. feeding on roots of a wide range of plants including strawberries.

w Vaughn, J. R., and Walters, H. J.
Chemicals for those plant diseases.
Circ. Wyo. agric. Exp. Stat. **56**, 1954, pp. 12.
Fungicides for seed treatment, soil treatment, sprays and dusts.

x Wishart, R. L.
Apricot gummosis. Symptoms, cause, control.
J. Dep. Agric. S. Aust., 1956, **59**: 389-98, bibl. 6, illus.
The present state of knowledge is summarized.

WEEDS AND WEED CONTROL.

General.

3599. Allen, H. P.
Weed problems in world agriculture.
Hampson, C. P.
Economics of weed control with special reference to MCPA.
Ashby, D. G., and Pfeiffer, R. K.
Weeds a limiting factor in tropical agriculture.
World Crops, 1956, **8**: 217-22, 223-6, bibl. 10, 227-9, illus.

Dr. Allen of Plant Protection discourses on the latest tendencies in the use of weed killers in sugar cane, peas and vegetables and against woody perennials and perennial grasses. C. P. Hampson of British Schering discusses economic effects of weeds. In the third article the authors, of Fisons Pest Control, plead for selective control of grasses in sugar cane, pineapple, tea, sisal, rubber and citrus, for bush clearance and the control of lalang and khans grass and for more adequate control of aquatic weeds in irrigation canals and elsewhere.

3600. Freeman, J. A.
Horticultural crops and sugar beets.
Res. Rep. nat. Weed Cttee (west. Sect.), Canada, 1955, Regina, Sask., pp. 99-108.

A series of abstracts on weed control in many crop plants of which the following are of horticultural interest: *vegetables:* asparagus, cucumber, onion and pea; *top fruits:* apple and pear; *small fruits:* strawberry and loganberry; and *bulbs:* tulip, daffodil, bulbous iris and gladiolus.—From *Weed Abstr.*, **5**, No. 537.

3601. Coupland, R. T.
Basic studies.
Res. Rep. nat. Weed Cttee (west. Sect.), Canada, 1955, Regina, Sask., pp. 115-20.

Life history studies. Work is reported on the inhibiting effect of extracts of *Euphorbia esula* and some other weeds on the germination and growth of themselves and other species. *Studies with herbicides* include, among many abstracts, a report on the effect of 2,4-D spray drift on young tomato plants.—From *Weed Abstr.*, **5**, No. 568.

3602. Dunn, S., and Datta, S. C.
Light effects of phytotoxicity with respect to herbicides.
Proc. 10th annu. Mtg N.E. Weed Control Conf., 1956, pp. 246-51, bibl. 9.

Brassica juncea plants were subjected to blue, pink, gold, warm white and cool white light (of equal intensity) for a given period, sprayed with 2,4-D and then returned to the same light. The reduction in dry weight of sprayed plants (compared with unsprayed plants subjected to the same light source) was greatest with blue and decreased in the above order. The response to 2,4-D of plants raised in daylight was less than that of plants raised in fluorescent light.—*Weed Abstr.*, **5**, No. 510.

3603. Matthews, L. J.
Chemical methods of weed control.
Bull. N.Z. Dep. Agric. **329**, 1956, pp. 100, illus.

This bulletin is divided into 4 sections. The first one deals with the properties of herbicides and summarizes their uses; the second lists, alphabetically, the weeds of New Zealand with notes on their control; the third gives recommendations for the control of weeds in crops and other specific areas; and the fourth discusses the most important weeds in New Zealand and their control problems.

Particular weeds or types of weed.

(*See also* 3693a, j.)

3604. Zick, W. H.
Factors influencing the effectiveness of maleic hydrazide in controlling quackgrass, *Agropyron repens.*
Diss. Abstr., 1956, **16**: 784, being *Publ.* 16224 of 135 pp.

Recovery of quackgrass from MH inhibition was retarded by ploughing or cultivating 3–10 days after MH application. Nitrogen fertilization prolonged the rhizome bud inhibition produced by MH; N also increased the relative efficiency of MH by stimulating quackgrass growth and thus increasing the absorptive surface. In pot experiments the greatest response to MH resulted from application in early May. Shading of quackgrass foliage before and after MH application resulted in reduced MH uptake, but increased shoot growth inhibition by MH. The diethanolamine salt of MH with a wetting agent was more effective than 2 other formulations on quackgrass. Rhizome bud activity was affected by the pH of MH solutions; higher pH levels stimulated, whereas lower pH levels inhibited, bud activity. The pH level did not affect action of MH in inhibiting bud initiation.—Univ. Wisconsin.

3605. Zick, W. H., and Buchholtz, K. P.
The influence of stage of growth on the control of quackgrass with maleic hydrazide.
From abstr. in *Proc. 12th annu. Mtg N. centr. Weed Control Conf., 1955*, pp. 2-3.

The effects of MH at 2, 4 and 8 lb./ac. applied to *Agropyron repens* at 3 stages of growth on April 17, May 1 and May 22 was studied. The greatest response was obtained from the May 1 application, the 8 lb./ac. rate inhibiting growth for 6 days after which there was a slow recovery. None of the rates applied on May 22 reduced shoot production and the 2 lower rates showed a marked stimulation at early dates of sampling. The effectiveness of the earliest application was probably limited by the absence of sufficient foliage to absorb MH.—From *Weed Abstr.*, **5**, No. 886.

3606. Parham, J. W., and Mune, T. L.
Prickly Solanum—Kausoni, *Solanum torvum* Swartz, a declared noxious weed.
Agric. J. Dep. Agric. Fiji, 1955, **26**: 86-7, bibl. 1, illus.

S. torvum, a shrubby weed of both plantations and pastures, is described and illustrated. Young plants up to 2 ft. high can be controlled with 2,4-D esters at 2 lb. acid equivalent per acre. Larger plants can be grubbed and their suckers similarly treated, or sprayed 2 or more times with 2,4-D esters at 4 lb. or 2,4,5-T esters at 3·6 lb. acid equivalent per acre.

3607. Meadly, G. R. W.
The thornapples (*Datura* species).
J. Agric. W. Aust., 1956, **5**: 289-95, illus.

A description of *Datura stramonium* with illustrations is given and the fruits of *D. ferox*, *D. metel* and *D. leichhartii* are also shown. Their significance as poisonous weeds is discussed. Sodium chlorate is recommended rather than the hormone weed killers for their control.

3608. Niering, W. A.
Chemical control of woody species: a summary.
Proc. 10th annu. Mtg N.E. Weed Control Conf., 1956, pp. 212-21, bibl. 29.

A review. The insertion of pieces of blotting paper soaked in sodium arsenite between the bark and wood of trees is a successful way of applying the compound and lessening the hazards involved in the use of arsenicals.—*Weed Abstr.*, **5**, No. 505.

3609. Naude, C. P., and Serfontein, J.
Eradication of lantana and thorn trees.
Fmg S. Afr., 1956, **31**: 209-10, bibl. 4, illus.

A basal spray containing 3⅕ oz. of the amyl ester of 2,4,5-T in 2 gal. diesoline or paraffin was found to kill *Lantana camara* and *Acacia karoo* within 6 months.

3610. Lynch, P. B., Matthews, L. J., and Thompson, F. B.
Measurements of distribution of weedkilling spray applied to gorse (*Ulex europaeus*) by helicopter and aeroplane.
N.Z. J. Sci. Tech., Sect. A, 1956, **37**: 505-22, bibl. 2, illus.

The swath width from a single "run" of the helicopter was about 60 ft. and that of the aeroplane about 110 ft. The assessed density of the aeroplane spray taken across the swath averaged about half that of the helicopter. The spray distribution across a single swath was more even with the helicopter and the wind-drift of spray was considerably less. The amount of spray penetrating the gorse bushes fell off rapidly towards the interior of the bushes with both machines.—Dep. Agric., Wellington, and Dep. Agric. Hamilton.

Control of aquatic weeds.

(*See also* 3693c.)

3611. Bruns, V. F., and others.
The use of aromatic solvents for control of submersed aquatic weeds in irrigation channels.
Circ. U.S. Dep. Agric. **971**, 1955, pp. 33, bibl. 14, illus.

In studies during 1947–1952 involving 153 fields tests at 4 stations in Washington, Idaho, Arizona and Utah, aromatic solvents of coal tar and petroleum origin meeting certain specifications gave satisfactory control of most kinds of submersed aquatic weeds in irrigation channels. Factors affecting treatments, such as materials, apparatus, rate of application, size of channel, velocity and temperature of water, type of weed-growth and susceptibility of species, are discussed. It was found that irrigation water containing aromatic solvents at concentrations necessary to control the most resistant submerged weeds caused no economically important injury to the irrigated crops, which included red Mexican and lima beans, carrots, lettuce and orchard grass. Laboratory tests indicated no damage to soil bacteria from experimental applications to crops. No cases of livestock poisoning by treated water were noted, but aquatic fauna were killed. [See also *H.A.*, 25: 433.]

3612. Bates, J. F.
Chemical control of aquatic weeds.
Proc. 1954 Mtg B.W.I. Sugar Tech., Trinidad, pp. 102-7, bibl. 5.

PCP, PCP/2,4-D, TCA and delta-BHC sprays were tested against aquatic weeds in irrigation canals in British Guiana. The "moss" types of submerged weeds were very well controlled by PCP at much lower cost than for hand clearing. PCP was not so effective against other species, but most troublesome weeds, except *Paspalum repens*, were controlled by a combination spray of PCP/2,4-D. *P. repens* was checked by the application of high rates of TCA, but this compound might damage sugar cane and is more expensive than hand weeding. Delta-BHC did not give satisfactory control of aquatic weeds. PCP killed the fish in the canals but they reappeared within a few months.—Bookers Sugar Estates, Ltd., B.G. J.R.L.

3613. Wilson-Jones, K.
Weed control experiments in the Sudan.
Pestic. Abstr. News Summ., 1956, **2**: 36-53.

Extracts from an unpublished report describe, among other things, work on the control of water weeds in irrigation channels. Sodium 2,4-D gave a high degree of weed control in small channels, copper sulphate showed promise for the combined control of weeds and snails, but aromatic solvents were unsatisfactory.

3614. Choudhuri, H. C.
"Mercene Special" as eradicator of water-hyacinth.
Sci. and Cult., 1956, **22**: 49-52, bibl. 5.

Experiments in earthenware tubs at the State Agricultural Research Institute, Calcutta, with Mercene Special and Mercene Special-A, both alkaline aqueous solutions of arsenic salts, showed that these chemicals were more highly selective than 2,4-D and methoxone in killing water hyacinth. Mercene Special A shows particular promise.

3615. Grigsby, B. H., Reimer, C. A., and Cutler, W. A.
Further studies on the use of dalapon for the control of cattail.
Proc. 12th annu. Mtg N. centr. Weed Control Conf., 1955, p. 60, bibl. 1.

The data from 2 years' trials with dalapon indicate that *Typha* spp. can be controlled by 6–14 lb./100 gal. of water applied at 50–200 gal./ac. The lower rates of treatment may require additional applications. The addition of 2,4,5-T or 2,4,5-TP can facilitate more rapid removal of the *Typha* tops. *Alisma plantago-aquatica* was not appreciably affected by repeated applications of dalapon, but when 2,4,5-TP was added seed-stalk formation was prevented. Oils and wetting agents did not increase the effectiveness of dalapon.—*Weed Abstr.*, **5**, No. 946.

Weed control in fruit crops.

(*See also* 3650, 3693d.)

3616. Säkö, J.
Kloraattien käytöstä rikkaruohojen hävittämiseen hedelmätarhasta. **(The use of chlorates for the destruction of perennial weeds in apple orchards.)** [English summary ⅓ p.]
Reprinted from *Maatalous ja Koetoim.*, 1956, **10**: 80-4.

In trials carried out since 1945 at the Agricultural Research Centre, Piikkiö, potassium and sodium chlorates were applied under the crowns of apple trees at the rate of 2–6 kg. per 100 sq. m. The chlorates caused no damage to the trees and did not reduce yields provided the soil was not cultivated for a year after treatment. When the soil was cultivated before the toxic effect of the chemical had disappeared tree growth ceased and the leaves became chlorotic.

3617. Curtis, O. F.
Growth of young apple trees weeded with CMU, Crag, Sesin, MH or dalapon.
Proc. 10th annu. Mtg N.E. Weed Control Conf., 1956, pp. 297-304.

In the first series of experiments CMU 0·8–3 lb./ac. once or twice yearly, Sesin 1·5–3 lb./ac., dinoseb 1·5 lb. in 10 gal. fuel oil/100 gal./ac., SES 2·5–5 lb./ac., or fuel oil fortified with dinoseb as a spot treatment were applied to one-year-old apple tree seedlings, mainly to control *Agropyron repens*. The most successful and least injurious treatment was 2 applications of CMU 3 lb./ac. yearly. None of the treatments produced any appreciable damage. In the second series dalapon 10 lb./ac. and MH 4–7 lb./ac. were compared with an oil treatment. There were indications that 2 applications of dalapon per year may decrease growth slightly (however, the rates used were higher than necessary) and that MH may increase trunk growth.—*Weed Abstr.*, **5**, No. 519.

3618. Hemphill, D. D.
Weed control around newly transplanted apple trees.
Proc. 12th annu. Mtg N. centr. Weed Control Conf., 1955, p. 49.

Chemical treatment applied in May to an area of 6 ft. [radius?] around 3 varieties of newly transplanted apples was compared with hand cultivation. The trunk of the tree was protected by a metal cylinder during spraying and no injury was recorded for CIPC 14 lb./ac., dalapon 2 lb./ac., oil+dinoseb (20 gal.+ 2 qt. dinoseb in 100 gal.) 80 gal./ac. or (1-chloropropyl-2) N-(3-chlorphenyl) carbamate 14 lb./ac. (CPCPC). CMU 2 lb./ac. alone or in combination with dalapon caused severe but erratic injury, but differences in degree of damage were not correlated with any varietal differences. CPCPC was considered to be the most promising herbicide applied, but none of the treatments was effective against *Campsis radicans*. CIPC also gave good weed control but was less effective than CPCPC against *Ambrosia* spp. The dinitro fortified oil gave control of most weeds for a period of 4–5 weeks only.—*Weed Abstr.*, **5**, No. 929.

3619. Trevett, M. F.
Control of lambkill (*Kalmia angustifolia*) in lowbush blueberry fields.
Proc. 10th annu. Mtg N.E. Weed Control Conf., 1956, pp. 193-8.

When 2,4-D or 2,4,5-T is applied in a water spray to lowbush blueberry fields the autumn before an early spring burn for the control of *Kalmia angustifolia*, minimum blueberry injury will occur if the treatment is deferred until the blueberry leaves have completely abscissed. Maximum weed control is obtained if the application is made in early autumn. A reasonable compromise might be to spray when the blueberry leaves are completely red and in the process of abscissing. 3 lb. a.e./ac. (ester) appears to be satisfactory. 2,4-D is more injurious to both crop and weeds than 2,4,5-T.—*Weed Abstr.*, **5**, No. 501.

3620. Aldrich, R. J.
A preliminary evaluation of weed control in cranberries.
Proc. 10th annu. Mtg N.E. Weed Control Conf., 1956, pp. 188-90, bibl. 1.

PDU, CMU and 3,4-DDU at 3, 4 and 5 lb./ac., MH at 2 and 4 lb./ac., CIPC at 3 and 4 lb./ac., amino-triazole at 1, 2 and 4 lb./ac., dalapon at 5–15 lb./ac. and a herbicidal oil were applied to cranberries to control *Lachanthes tinctoria*. MH, CIPC and amino-triazole at 1–2 lb./ac. were non-injurious. CMU at 4 and 8 lb./ac., the herbicidal oil and amino-triazole at 1–2 lb./ac. gave excellent weed control but only the last was sufficiently selective.—*Weed Abstr.*, **5**, No. 499.

3621. Dana, M. V.
Weed control in Wisconsin cranberry marshes.
Proc. 12th annu. Mtg N. centr. Weed Control Conf., 1955, p. 50, bibl. 5.

The weed control programme in Wisconsin cranberry marshes is built round good cultural practice and the use of non-selective herbicides. In this general account the use of petroleum derivatives is described. These are best applied in the spring at 300–500 gal./ac. or enough to wet the weeds thoroughly. Among the weeds which may be reduced by oil treatments are *Carex oligosperma*, *C. rostrata*, *Muhlenbergia sylvatica*, *Glyceria canadensis*, *Hordeum jubatum* and *Leersia aryzoides*. Weeds which appear after cranberry growth has started cannot be treated with oil sprays without risk of damaging the crop. Iron sulphate is sometimes used to check *Anemone canadensis*, *Ambrosia artemisiifolia*, *Bidens* sp. and *Onoclea sensibilis*. Copper sulphate is occasionally used to control *Dulichium arundinaceum*, the best results being obtained by dusting the material on to the plants when they are wet. Wiping with 2,4-D (amine) is used extensively for the control of swamp smartweed (*Polygonum* spp.) and *Salix* spp. Preliminary reports from several workers on the use of selective herbicides describe the use of dalapon to control *Carex rostrata*, amino triazole for *Lachnanthis tinctoria*, and TCA at 40–80 lb./ac. for *Leersia aryzoides*, although this rate was damaging to the cranberries.—*Weed Abstr.*, **5**, No. 931.

3622. Herron, J. W., and Chaplin, C. E.
Weed control in strawberries.
Proc. 12th annu. Mtg N. centr. Weed Control Conf., 1955, pp. 49-50.

SES and Natrin at 3, 4 and 6 lb./ac. were applied to Tennessee Beauty strawberries at 2 date series, one in May, June and September and the other in May, June, July and September. Application in May was not as effective for weed control as later treatments, probably owing to higher rainfall. Some runner inhibition was apparent in July on the plants treated with 6 lb. SES but the plants recovered by September and no inhibition of runners or rooting of these runners was recorded from any of the treatments.—*Weed Abstr.*, **5**, No. 930.

3623. Solovjeva, N. V., and Aliev, A. G.
Dodder control in vineyards. [Russian.]
Sad i Ogorod, 1956, No. 5, pp. 69-70, illus.

In Azerbaĭdžan vineyards the most widely distributed dodder is *Cuscuta monogyna*, but *C. arvensis* is also encountered. Of control measures tested 3 applications of distillation residues of dichloroethane at 120–150 c.c. per 0·6–1 sq. m. of soil gave the best results.

3624. Scholz, E. W., Loomis, W. E., and Lantz, H. L.
Effects of 2,4-D on Concord grape.
Proc. 12th annu. Mtg N. centr. Weed Control Conf., 1955, p. 57.

These experiments were designed to determine the seriousness of leaf damage caused by air contamination by draft from volatile formulations of 2,4-D. Sprays of 100 p.p.m. 2,4-D applied before flowering reduced fruit set from 27·6 to 4%. Leaf area was reduced by 10 and 100 p.p.m. but the plants made rapid recovery. Sprays of 10 p.p.m. applied on July 10th caused uneven ripening of the fruit, and 100 p.p.m. caused delay of maturity and resulted in complete loss of the crop. No immediate injury was observed from applications of 100 p.p.m. 2,4-D at harvest time, but the following spring severe symptoms of 2,4-D injury were observed and fruit set of 4-year-old plants was reduced, while 24-year-old vines produced grapes with significantly reduced sugar content.—From *Weed Abstr.*, **5**, No. 941.

Weed control in lawns.

3625. Wisnieski, A. J., and De France, J. A.
Clover control in lawn turf with springtime application of chemicals.
Proc. 10th annu. Mtg N.E. Weed Control Conf., 1956, pp. 68-72, bibl. 2.

Two applications each of 2,4,5-T at 0·5 lb. per acre, endothal at 18·5 oz. per acre and 2,3,6-trichlorobenzoic acid at 1·6 lb. per acre gave 98·8, 90 and 74% control respectively of *Trifolium repens*.—From *Weed Abstr.*, **5**, No. 473.

3626. Lantz, H. L.
Chemical control of crab grass in lawns, golf greens and other turfgrass areas.
Proc. 12th annu. Mtg N. centr. Weed Control Conf., 1955, p. 53.

A summary statement on studies with *Digitaria sanguinalis* at Amos from 1950–1955 is given. In pre-emergence tests SES 1·5 oz., ACPL 2·25 oz., ACPL 888 2·25 oz. and Alanap 7F 18 lb. applied to 1,000 sq. ft. all reduced the stand of *D. sanguinalis* without injury to the bluegrass sod. When the weed was at the 2-leaf stage PMA gave excellent control. The application of disodium methyl arsonate at this stage gave 100% control of *D. sanguinalis*, but benzyl arsonate was slightly less effective. Two applications of potassium cyanate of 4 oz./1,000 sq. ft. applied during the seed head stage reduced the stand of *D. sanguinalis* to 5% as compared with controls. Mixtures of powdered potassium cyanate and fertilizer gave excellent results and prevented burning of the bluegrass which was apparent with spray application. The importance of a fertilizer programme to stimulate bluegrass when weed-infested turf is being restored is emphasized.—*Weed Abstr.*, **5**, No. 936.

3627. Nylund, R. E., and Stadtherr, R.
Studies on the control of crabgrass in bluegrass lawns.
Proc. 12th annu. Mtg N. centr. Weed Control Conf., 1955, pp. 53-4.

Over a period of 4 years 26 herbicides were tested for their effectiveness in controlling *D. sanguinalis* in a bluegrass lawn. From 4 years' tests with potassium cyanate and PMA it was concluded that 2–3 applications of cyanate at 8 lb./ac. after emergence of *D. sanguinalis* killed an average of 76%, and PMA at 0·5–0·9 lb./ac. killed an average of 89%. High temperatures and drought increased the degree of injury to the bluegrass from these two herbicides. Other herbicides which gave fair to good control but were not so thoroughly tested are listed.—From *Weed Abstr.*, **5**, No. 937.

3628. Hart, S. W., and De France, J. A.
Post-emergence crabgrass control with chemicals in lawn turf.
Proc. 10th annu. Mtg N.E. Weed Control Conf., 1956, pp. 61-7, bibl. 5.

Two applications each of disodium methyl arsonate at 2 and 3·4 lb. per acre, PMA at 10 and 17 lb. per acre and potassium cyanate at 1·7 lb. per acre gave over 90% control of *Digitaria ischaemum* and *D. sanguinalis* and caused little or no lawn grass discoloration. Copper sulphate at 21·5 lb. per acre applied 3 times gave similar results.—From *Weed Abstr.*, **5**, No. 472.

3629. De France, J. A., and Hart, S. W.
Post-emergence control of crabgrass in putting-green turf.
Proc. 10th annu. Mtg N.E. Weed Control Conf., 1956, pp. 77-82, bibl. 4.

PMA and disodium methyl arsonate each at 1 oz. per 1,000 sq. ft. gave good control of *Digitaria* spp. without injuring the turf grasses.—From *Weed Abstr.*, **5**, No. 475.

3630. Hart, S. W., and De France, J. A.
Pre-emergence control of crabgrass with chemicals.
Proc. 10th annu. Mtg N.E. Weed Control Conf., 1956, pp. 83-90, bibl. 3.

Of the herbicides used 3-(3,4-dichlorophenyl-1-methyl-1-N-butylurea) at 3·2 lb./ac. was the best, giving 85% control of *Digitaria ischaemum* and *D. sanguinalis* without causing any appreciable injury to the lawn grasses.—From *Weed Abstr.*, **5**, No. 476.

3631. Engel, R. E., and Skogley, C. R.
Crabgrass control with organic arsenicals —1955.
Proc. 10th annu. Mtg N.E. Weed Control Conf., 1956, pp. 91-2.

Of 9 chemicals used 6 gave over 90% control of *Digitaria* spp. The best results were obtained with 3 treatments of methyl arsonic acid at 3 lb./ac. and 2 treatments at 6 lb./ac. giving 99% control, and with 3 treatments of PMA at 0·7 lb./ac. giving 97% control. Neither chemical caused turf injury.—From *Weed Abstr.*, **5**, No. 477.

3632. Escritt, J. R.
Calcium cyanamide for the preparation of weed-free composts and seed beds.
J. Sports Turf Res. Inst., 1955, **9**: 85-9, illus.

In confirmatory trials calcium cyanamide was mixed with compost soil, intended for topdressing turf, at a rate of 13 lb. per cu. yd. Weed control was successful but the pH was increased. On turf seedbeds a rate of 4 oz. per sq. yd. of calcium cyanamide gave almost complete weed control, and grass growth was excellent.

Weed control in flower bulbs.

3633. Crossley, J. H.
Experiments in weed control with herbicides in bulb crops at Saanichton.
Proc. Bulb Grs' short Course 1955, Tacoma, Wash., pp. 28-9.

CMU has successfully controlled annual weeds in tulips, daffodils and irises without affecting the bulbs. Where only an autumn application is given 3–4 lb. of 80% CMU per acre is recommended. For applications in autumn and spring, or in spring only, a rate of 1 lb. of 80% CMU is sufficient.—Domin. exp. Stat., Saanichton, B.C.

3634. Crossley, J. H., and Adamson, R. M.
Chemical weed control in bulb crops at Saanichton.
Proc. Bulb Grs' short Course 1956, Tacoma, Wash., pp. 43-6, bibl. 1, illus.

Two seasons' experiments have led to the following recommendations: application in mid-October of a pre-emergence spray of CMU at 2·5–3·2 lb. per acre; when seedling grasses or resistant species are present IPC should be added to the spray. In one season's trials on tulips excellent control of annual weeds was obtained with 0·8 lb. CMU plus 2 lb. CIPC per acre. —Domin. exp. Stat., Saanichton, B.C.

3635. Peabody, D. V., Jr.
Weed control experiments in Washington (1953-1954).
Proc. Bulb Grs' short Course 1955, Tacoma, Wash., pp. 29-30.

In irises, tulips and daffodils dinitro amine at 4·5 lb. in 30–100 gal. per acre gave the best control of broad-leaved winter annual weed species. CMU at 0·8 lb. in 30–100 gal. per acre gave the best control of summer annual weeds.—N.W. Wash. agric. Exp. Stat., Mt Vernon.

3636. Peabody, D. V., Jr.
Weed control in bulbs in Washington (1954-1955).
Proc. Bulb Grs' short Course 1956, Tacoma, Wash., pp. 41-2.

CMU, DMU and dinitro amine pre-emergence treatments gave excellent control of winter annual weeds with no apparent bulb injury. CMU and DMU post-emergence treatments gave excellent control of summer annual weeds but tended to reduce yields of tulip bulbs. Iris and narcissus bulb yields were not affected by CMU. Treatment with CMU did not affect forcing, except that tulips treated the previous season tended to flower a few days earlier than untreated bulbs. Yields of all bulbs grown except the narcissus L'Innocence were reduced by DMU treatment.—N.W. Wash. agric. Exp. Stat., Mt Vernon.

3637. Bing, A.
1955 gladiolus weed control.
Bull. N.Y. St. Flower Grs, 1956, No. 128, pp. 2-4, bibl. 6.

In the latest trials with pre-emergence herbicides CIPC and 3,4-DDU were particularly effective in suppressing weeds and also produced increased yields of corms and cormels as compared with hand-weeded plots. From these and other trials it is concluded that the best pre-emergence herbicides for use in gladiolus are (in order of preference and with rate per acre in 40–100 gal. water): CIPC (4–8 quarts), dinoseb (4–6 quarts), 3,4-DDU ($\frac{3}{4}$–1$\frac{1}{2}$ lb.), 2,4-D esters (1–3 lb.), and 2,4-DES (3–6 lb.).—Ornamentals Res. Lab., Farmingdale, L.I., N.Y.

Weed control in ornamentals and nursery stock.

3638. v.d. Graaf, A. J.
Chemische onkruidbestrijding in pioenen. **(Chemical weed control in peonies.)**
Jaarb. Proefst. Boomkw. Boskoop 1955, pp. 108-9.

By spraying peonies in September or October when the weeds were small with a mixture of DNC 0·5% and IPC 0·7% the ground was kept weed-free until April, and growth of peonies was improved.

3639. van Lint, H.
Chemische onkruidbestrijding op zaaibedden van coniferen. **(Chemical weed control in conifer seed beds.)**
Jaarb. Proefst. Boomkw. Boskoop 1955, pp. 112-14.

Satisfactory weed control was obtained in seed beds of *Pinus sylvestris*, *Pinus nigra corsicana* and *Pinus nigra austriaca* with a post-emergence spray of Shell W at 750 l./ha. A pre-emergence application to a *Pseudotsuga douglasii* seedbed of PE30 (30 l./ha.) plus CIPC (5 l./ha.) controlled weeds for a long period.

3640. Holm, L. G., and Taylorson, R.
Mixtures of herbicides for nursery weed control.
Proc. 12th annu. Mtg N. centr. Weed Control Conf., 1955, pp. 51-2.

Two-year-old seedlings of Blue spruce, Black Hills spruce, Norway spruce, Scotch pine, Red Cedar, Austrian pine, White pine, Arbor vitae and Douglas fir were transplanted in autumn and treated in the spring, in July and in the following April with SES 4 lb./ac., Sesin 4 lb./ac., Natrin 4 lb./ac., 2-methyl-4-chlorophenoxyethyl sulphate 4 lb./ac., CMU 0·5 lb./ac. +SES 4 lb./ac. or NP 0·5 lb./ac.+SES 2·5 lb./ac. Terminal growth measurements were taken during the second growing season. There was no apparent injury from any treatment with the exception that Black Hills spruce and Douglas fir were retarded slightly where NP was used 3 times in 2 seasons. In another experiment, which included some additional species, plants treated in April showed no injury in July.—From *Weed Abstr.*, **5**, No. 933.

3641. Chadwick, L. C., and Barker, P. A.
Tolerances of certain nursery stock to CMU and SES.
From abstr. in *Proc. 12th annu. Mtg N. centr. Weed Control Conf., 1955*, p. 52.

To determine the tolerance of certain ornamental potted plants, 2-year-old Norway spruce, Japanese maple and flowering dogwood, 3-year-old *Taxus*, 4-month-old *Forsythia* and 2-month-old marigolds were treated with 1–4 applications of CMU, SES or combinations of these at 0·5 or 4·0 lb./ac. Time between each application was about 10 weeks and from half the pots in each plot the leachate was returned to the pot soil each week. All the marigolds treated with CMU were killed, but they were unharmed by SES alone. Most of the dogwood which was treated with SES was killed. The remaining species showed no damage after the third application. No significant difference could be assessed where the leachate was returned to the pot soil.—*Weed Abstr.*, **5**, No. 934.

3642. Chadwick, L. C., and Chambers, W. D.
Chemical growth suppression of nursery companion crops.
Proc. 12th annu. Mtg N. centr. Weed Control Conf., 1955, p. 51.

To suppress the growth of nursery companion crops mixtures of MH and 2,4-D were applied as directed sprays in a nursery of 7-year-old *Taxus*. Some growth suppression of Kentucky bluegrass, Chewings fescue, birdsfoot trefoil and alsike clover was recorded 5 weeks later. In another test in which CIPC and/or 2,4-D and 2,4-D-MH mixtures were compared at several dates of application, CIPC was effective in stopping the growth of the grasses.—*Weed Abstr.*, **5**, No. 932.

3643. Chadwick, L. C., Barker, P. A., and Chambers, W. D.
Chemical weed control in a *Taxus* nursery.
From abstr. in *Proc. 12th annu. Mtg N. centr. Weed Control Conf., 1955*, p. 52.

During 1955 tests were made with CMU 0·5 lb./ac., SES 4 lb./ac. and CMU 0·5+SES 3 and 4 lb./ac. applied in June and August in a 5-year-old nursery of *Taxus*. Best control of seedlings of *Portulaca oleracea* and pigweed was obtained with CMU 0·5+SES 4 lb./ac. Further experiments with SES 4 lb./ac., NP 5 lb./ac. and CIPC 7·5 lb./ac. showed no damage to *Taxus* plants.—*Weed Abstr.*, **5**, No. 935.

Weed control in tropical crops.

(*See also* 3613, 3693b, k, 4206.)

3644. Childs, J. M.
Chemical control of lalang.
Pestic. Abstr. News Summ., 1956, **2**: 81-6, bibl. 1.

A review of lalang, *Imperata* sp., control, mainly in Malaya and Indonesia. Repeated applications of sodium arsenite or oils followed by wiping the surviving plants or spot spraying with oil appear the most effective and economical treatments. Heavy rates of sodium arsenite in oil palm plantations reduced yields and slightly contaminated the oil.

3645. V[allance], L. G., S[kinner], J. C., and B[ates], G.
A useful weedkiller.
Cane Grs' quart. Bull., 1956, **19**: 126, illus.

A boron compound, Borascu, plus sodium chlorate at 30 lb. per 100 sq. ft. effectively controlled a plot of very vigorous wild cane (*Saccharum spontaneum*), which had previously resisted numerous herbicides. The mixture is too costly, however, for general use.

3646. Steward, E.
Control of weeds in plant cane by chemical spray.
S. Afr. Sugar J., 1956, **40**: 429-33, bibl. 3, illus.

Preparations of 2,4-D and pentachlorophenol have been used in weed control trials. 2,4-D applications 2 or 3 days after planting kept broad-leaved weeds under control for about 2 months. A mixture of the 2 preparations applied as a pre-emergence spray or later gave effective control of weeds and water grass. Costs and rates of application are given.

3647. Hayot, H.
Some results of chemical weed-control in Martinique.
Proc. 1954 Mtg B.W.I. Sugar Tech., Trinidad, pp. 101-2.

In 11 field experiments on sugar cane commercial formulations of pentachlorophenol, sodium pentachlorophenate plus sodium monochloroacetate and

3 formulations of 2,4-D were tested. When used before weed emergence the best economic results were given by Na 2,4-D at 2·7 to 3·0 lb. per acre. When used after weed emergence Na 2,4-D gave good control of creepers and nutgrass. PCP also gave good results against grasses, if they were not too tall, if applied when the cane was about to "close-in". Adding 2,4-D to PCP improved control of the dicotyledons but not of the monocotyledons. 2,4-D favoured the growth of the monocotyledons. Sodium pentachlorophenate plus sodium monochloroacetate gave results similar to those obtained with PCP. The growth of young canes, up to 10 days from sprouting, was slowed down a little by 2,4-D. J.R.L.

3648. Skinner, S. O., and Anderson, J.
The giant sensitive plant.
Cane Grs' quart. Bull., 1956, **19**: 118-23, illus.

Mimosa pudica is described and notes given on its control in sugar cane by cultivation, hand pulling and spraying with arsenicals and 2,4-D.

3649. Nakayama, A., and others.
Studies on the prevention of weeds in the tea garden. [Japanese, with English summary pp. 2.]
Bull. Tea Div. Tôkai-Kinki agric. Exp. Stat., 1954, No. 2, pp. 1-64, bibl. 47, illus.

The ecology of weeds in a tea garden was studied and the changes induced by weeding were observed. The herbicidal effect of 2,4-D was most marked on broad-leaved plants. *Digitaria ciliaris* was killed by a 0·1% solution of 2,4-D and *Polygonum* spp. by a 0·02% solution. Seeds of Gramineae and *Polygonum* spp. were resistant to 2,4-D and those of Compositae were susceptible. The number of emerging shoots of *Houttuynia cordata* and *Oxalis martiana* were reduced by spraying with 2,4-D. 2,4-D toxicity to tea, caused by a 0·01% solution, was characterized by twisting and wilting of the leaves. Of the herbicides used 2,4-D and 2,4,5-T were the most toxic, while Weedone Concentrate 48 and New Improved Weedone were least toxic to tea. Herbicide applications were most effective in the summer, especially when repeated. 2,4-D penetrated the soil to a depth of 8 cm. and the residual effect was apparent for 1 month; MCP was fixed near the soil surface.

Weed control in vegetables and tobacco.

(*See also* 3601, 3693i.)

3650. Crawford, D. V., and Heydecker, W.
Chemical weed control. 1955 trial.
[*Mimeo.*] *Nottingham Univ. Sch. Agric.*, 1956, pp. 10.

The results are reported of tests with 19 chemicals or combinations of chemicals used in pre- and post-emergence applications for weed control in many vegetable and field crops and strawberries.

3651. Danielson, L. L.
Herbicide evaluations on vegetable leaf crops.
Proc. 10th annu. Mtg N.E. Weed Control Conf., 1956, pp. 124-31.

Some 10 compounds were tested for herbicidal action and effect on spinach, kale, cabbage, lettuce, turnip, mustard, collard, onion and carrot. Pre-emergence applications of propynyl N-phenyl carbamate, propynyl N-(3-chlorophenyl) carbamate and CIPC at rates varying from 1 to 4 lb. per acre could be used in all crops.—From *Weed Abstr.*, **5**, No. 485.

3652. Marshall, E. R., Bayer, G., and Robinson, D.
Observations and summary of results of 1955 pre-emergence herbicide screening plots on eight crops.
Proc. 10th annu. Mtg N.E. Weed Control Conf., 1956, pp. 265-9.

Some 26 herbicides were tested on cucumbers, beets, spinach, soybeans, green beans, lima beans, peas and maize. The results are very incompletely presented and the only conclusions drawn are: (1) a low volatile formulation of CIPC gave better weed control than a wettable powder, (2) 2,3,6-trichlorobenzoic acid showed selectivity only on maize, (3) 2,4-D (amide) was more effective on broadleaf weeds than the emulsifiable acid or butoxyethanol ester, (4) 2-chloro-4,6-bis (diethylamino)-S-triazine only showed selectivity in peas, (5) irrigation increases herbicidal effect particularly of benzoics, (6) wettable powders were as good as, but no better than, emulsifiable formulations. —From *Weed Abstr.*, **5**, No. 515.

3653. Rahn, E. M.
The effect of pre- and post-emergence applications of certain herbicides on asparagus seedlings.
Proc. 10th annu. Mtg N.E. Weed Control Conf., 1956, pp. 165-8, bibl. 3.

PCP at 4·8 lb./ac. caused no injury as a pre-emergence spray to asparagus (var. Mary Washington), but at 10 lb./ac. it was harmful. Plots previously treated with PCP 4·8 lb./ac. also received the following treatments: pre-emergence CMU 1 lb./ac., NP 2 lb./ac., post-emergence CMU 1 and 2 lb./ac., NP 2 and 4 lb./ac., Stoddard Solvent 75 gal./ac.; only the latter was injurious.—*Weed Abstr.*, **5**, No. 494.

3654. Noll, C. J., and Odland, M. L.
Chemical weeding of garden beets.
Proc. 10th annu. Mtg N.E. Weed Control Conf., 1956, pp. 153-6.

Endothal was applied to garden beets 1, 4 and 7 days after sowing at 4, 8 and 12 lb./ac. There was no significant difference between rates or times of application. In a second experiment several herbicides were applied pre-emergence and beet yield was mainly dependent on suppression of weed competition. The following gave fair to good yields and fair to good weed control: endothal 4 lb./ac. plus TCA 10 or 20 lb./ac., 3,4-DDU 1 lb./ac., CMU 1 lb./ac., α-chloro-N, N-diallyl acetamide 8 lb./ac., bis (ethyl xanthogen) disulphide at about 10–29 lb./ac. The best treatment was α-chloro-N,N-diallylacetamide 8 lb./ac.—From *Weed Abstr.*, **5**, No. 491.

3655. Bleasdale, J. K. A.
Interspecific competition in higher plants.
Nature, 1956, **178**: 150-1, bibl. 1.

Interspecific competition between vegetable crops and annual weeds was studied in two pot experiments and one field experiment. In the pots carrots were sown with chickweed and globe beet with annual nettle at varying relative densities and in the field experiment globe beet was grown with a naturally dispersed and mixed weed population. Preliminary results suggest, in the author's words, "that the weight of weed in a crop is linearly related to the percentage cover of the weed (at least over a considerable range of cover). It is hoped that cover assessments, which are non-destructive and easily obtained, may prove useful in determining the time of onset of competition. Such information could then be used for assessing the best time to apply weed control measures and to evaluate present weed control practice."—Nat. Veg. Res. Stat., Wellesbourne.

3656. Metlin, Ju. B.
Methods of weed control in carrots. [Russian.]
Sad i Ogorod, 1956, No. 5, pp. 25-9, illus.

Methods, rates and dates of kerosene application for weed control in carrots are discussed. The best results were obtained when the kerosene was applied to the rows at 300 l. per hectare and the interrows were cultivated. This treatment necessitated only 1 hand weeding instead of the customary 3 and was much cheaper. Kerosene did not depress the yields nor did it affect the flavour of the carrots at harvest.

3657. Warren, G. F.
Some new possibilities for weed control in carrots.
Proc. 12th annu. Mtg N. centr. Weed Control Conf., 1955, p. 47.

In field experiments conducted on Red Cored Chantenay carrots Stoddard solvent was applied at various volumes alone and in combination with CIPC. Carrot yields were significantly reduced by CIPC at 4 lb./ac. in 25 gal. and at 8 lb. in 25 and 50 gal. of Stoddard Solvent. Decreasing the spray volume of these mixtures from 50 to 25 gal. increased the damage to the crop. Little or no noticeable effect on the crop or on the yield was recorded with Stoddard Solvent at 50 and 100 gal./ac., CIPC at 4 lb./ac. in 50 gal. of solvent, CIPC at 8 lb./ac. in 50 gal. water or 2-chloro-4,6-bis (diethylamino)-S-triazine at 12 lb./ac. in 50 gal. water. All treatments gave good control of *Portulaca oleracea*, *Polygonum* spp., *Amaranthus retroflexus* and annual grasses; 50 gal. Stoddard Solvent and 8 lb. CIPC, however, were less effective than the other treatments. —*Weed Abstr.*, **5**, No. 927.

3658. Jasmin, J. J., and Browne, F. S.
Selective herbicidal oil on celery.
Proc. 10th annu. Mtg N.E. Weed Control Conf., 1956, pp. 150-2, bibl. 2.

Herbicidal oils applied to celery 11, 18 and 4 plus 18 days after planting at 60 gal. per acre reduced yields and increased suckering.—From *Weed Abstr.*, **5**, No. 490.

3659. Grigsby, B. H., and others.
Growth of cucumbers, corn, field and snap beans following chemical sprays for control of quackgrass.
Proc. 12th annu. Mtg N. centr. Weed Control Conf., 1955, pp. 46-7.

Various combinations of dalapon, amino triazole and MH were applied to a 2-year-old sod of *Agropyron repens*, which was ploughed 7 days later and prepared for planting. Dalapon at 10 lb./ac. and at 5 lb. in combination with 2 lb. of amino triazole and 2 lb. MH gave good control of *A. repens.* Amino triazole at 4 lb./ac., MH at 4 lb./ac. and combinations of 2 lb. of each failed to give effective control. Yields of maize and snap beans were not reduced by any treatments. Field bean yields were slightly reduced by treatment with dalapon and amino triazole. Cucumber yields were reduced by treatments containing MH. Crop yields were more affected by competition from *A. repens* than by any chemical treatment.—*Weed Abstr.*, **5**, No. 926.

3660. Trevett, M. F.
Pre-emergence weeding of snap beans with amino triazine, CDEA (diethyl-acetamide), CDEC (diethyldithiocarbamate) and dinitro.
Proc. 10th annu. Mtg N.E. Weed Control Conf., 1956, pp. 132-6.

Dinoseb at 4·5 lb./ac., 2-chloroallyl diethyldithiocarbamate (CDEC) at 8 lb./ac., dinoseb at 3 lb. plus CDEC at 4 lb. and 2-chloro-4,6-bis(diethyl amino)-S-triazine (amino triazine) applied pre-emergence to kidney beans all gave yields at least double that of the control. Dinoseb plus CDEC gave the highest yield and a very good control of broadleaved weeds and annual grasses.—*Weed Abstr.*, **5**, No. 486.

3661. Marshall, E. R., Bayer, G., and Robinson, D.
Tests with new materials for pre-emergence weed control in red kidney beans.
Proc. 10th annu. Mtg N.E. Weed Control Conf., 1956, pp. 143-6.

MCP-ethyl sulphate at 3 lb./ac., 2-chloro-4,6-bis (diethylamino)-S-triazine at 6 lb./ac., and MCPB at 2 lb./ac. injured kidney beans. Dinoseb α-chloro-N, N-diallyl acetamide, α-chloro-N,N-diethylacetamide and 2-chloroallyl-diethyldithiocarbamate all at 6 lb./ac. were non-injurious and the 3 last named compounds gave very good control of *Chenopodium album*, *Ambrosia artemisiifolia* and *Amaranthus retroflexus.*—From *Weed Abstr.*, **5**, No. 48.

3662. Furuya, M., and Osaki, S.
Effects of the vapour of methyl 2,4-dichlorophenoxyacetate on growth and differentiation in *Phaseolus vulgaris* L. I. Formative effects induced in the seedling after various grades of application on dry seeds.
Jap. J. Bot., 1955, **15**: 117-39, bibl. 15, illus.

Resting seeds of Masterpiece bean were exposed before sowing to vapours of the herbicide methyl 2,4-dichlorophenoxyacetate at a constant temperature of 25° C. for 1, 2, 3, 4, 5 or 7 weeks. Treatment had no effect on percentage germination but retarded development in the cotyledon and first foliage leaf stages, growth inhibition increasing with length of exposure. Modifications in anatomy and leaf shape resulting from treatment are described. The effects did not persist in the second generation.—Univ. Tokyo.

3663. Singletary, C. C., and Herron, J. W.
Pre-emergence herbicide treatments on lima beans, snap beans and sweet corn.
Proc. 12th annu. Mtg N. centr. Weed Control Conf., 1955, pp. 45-6.

In 1955 SES and Natrin at 4 and 6 lb./ac., dinoseb at 4 lb./ac. and CIPC at 6 and 8 lb./ac. were applied in 50 gal. of water immediately following planting of snap and lima beans and sweet corn. Weed control was more than 75% as compared with untreated plots. Dinoseb and CIPC caused no apparent injury to any of the crop plants and increased the yields of snap beans and sweet corn (lima beans failed to set pods), while with SES and Natrin there was some degree of injury to all crops.—From *Weed Abstr.*, **5**, No. 925.

3664. Rahn, E. M.
A comparison of several herbicides for lima bean weed control, under high and low soil moisture levels.
Proc. 10th annu. Mtg N.E. Weed Control Conf., 1956, pp. 137-42.

PCP (sodium and phenol) at 22 lb./ac., dinoseb (amine and phenol) at 6 lb./ac., NP at 1·8 lb./ac. and 2-chloroallyl diethyldithiocarbamate at 6 lb./ac. were tested as pre-emergence herbicides in lima beans. Where 2 in. of irrigation water was applied 3 days after application and temperatures were above 90° F. dinoseb (amine) was not very effective; under these conditions PCP gave good results; NP caused considerable injury. —From *Weed Abstr.*, **5**, 487.

3665. Trevett, M. F., and Murphy, H. J.
Pre-emergence weeding of processing peas.
Proc. 10th annu. Mtg N.E. Weed Control Conf., 1956, pp. 157-60.

The best results in 2 years' experiments were given by dinoseb (amine) at 4·5 lb. in 50 gal. per acre. In one year pea yields from plots treated with dalapon approached those of the dinoseb plots, but in the other year, when there was considerable rainfall in the 3 weeks after application, dalapon caused significant yield reductions.—From *Weed Abstr.*, **5**, No. 492.

3666. Statens Forsøgsvirksomhed i Plantekultur.
Forsøg med ukrudtsbekaempelse i aerter.
(Experiments on weed control in peas.)
Medd. Stat. Forsøgsvirks. Plantekult. **507**, 1956, pp. 2.

A dinitro compound, alone or in combination with a hormone herbicide, is recommended for weed control in garden and field peas. Data of four years' experiments at several Danish research stations are tabulated and instructions on dosage are given.

3667. Jasmin, J. J., and Ferguson, W.
Weed control in onions.
Proc. 10th annu. Mtg N.E. Weed Control Conf., 1956, pp. 147-9, bibl. 1.

Chemical treatments gave higher yields of marketable onions than mechanical weeding, with pre-emergence CMU at 1 lb./ac. as the best, although none of the differences was significant.—From *Weed Abstr.*, **5**, No. 489.

3668. Dallyn, S. L., Sawyer, R. L., and Seif, R. D.
A comparison of the herbicidal properties of several carbamates.
Proc. 10th annu. Mtg N.E. Weed Control Conf., 1956, pp. 252-5, bibl. 5.

Eight carbamates were compared with CIPC for weed control, residual effect and crop injury to sweet Spanish onions. None injured the crop, but only a solid diluent impregnated with CIPC and low volatile CIPC were as satisfactory in all 3 respects as was the standard CIPC.—From *Weed Abstr.*, **5**, No. 511.

3669. Dallyn, S. L., Sawyer, R. L., and Seif, R. D.
Weed control in transplanted sweet Spanish onions.
Proc. 10th annu. Mtg N.E. Weed Control Conf., 1956, pp. 261-4, bibl. 1.

CIPC at 4 lb. per acre and CMU and 3,4-DDU each at 0·5 and 1 lb. per acre were applied to sweet Spanish onions by 9 different methods. The best treatments were 3,4-DDU and CIPC sprayed 3, 6, 9 and 12 weeks after planting, and only these and CMU similarly applied (which caused crop injury) did not require hand weeding.—From *Weed Abstr.*, **5**, No. 514.

3670. Roberts, H. A.
A comparison of pentachlorophenol and sulphuric acid for pre-emergence weed control in onions.
A.R. nat. Veg. Res. Stat., Wellesbourne, for 1955, 1956, pp. 58-60, bibl. 1.

Pentachlorophenol in the miscible oil type of formulation used in these trials was a satisfactory alternative to sulphuric acid for pre-emergence use in spring-sown onions.

3671. Wolf, E. A., and Guzman, V. L.
Combination of chemical and mechanical weed control in three varieties of onions in muck soil.
Proc. Amer. Soc. hort. Sci., 1955, **66**: 289-92, bibl. 5, illus.

Pre-emergence treatment of direct-seeded onions with 12 lb. CIPC per acre, alone or in combination with 2 post-emergence applications of 10 lb. NIX or 25% sulphuric acid or 12 lb. potassium cyanate per acre, produced significantly larger yields than the hand weeded controls. The post-emergence treatments were applied to the base of the onion plants simultaneously with cultivation between the rows. Pre-emergence CIPC treatment controlled weeds for about 6 weeks and eliminated 1 hand weeding. All post-emergence treatments gave good weed control and eliminated 2 hand weedings. The 3 varieties of onion, Granex, Texas Early Grano and Early Grano, showed no differences in reaction to the chemical treatments.—Everglades Exp. Stat., Belle Glade, Fla.

3672. Guzman, V. L., and Wolf, E. A.
Pre-emergence weeding with three rates of CIPC in combination with post-emergence weeding with pelletized CIPC in three varieties of onions.
Proc. Amer. Soc. hort. Sci., 1955, **66**: 284-8, bibl. 3, illus.

CIPC applied as a pre-emergence spray at rates of 12, 16 and 20 lb. per acre in combination with 3 post-emergence applications of 10 lb. each per acre of CIPC in pelletized form gave good weed control until harvest. The CIPC treatments did not affect the yields of the Granex, Texas Early Grano and Early Grano varieties. Two post-emergence directional applications of 10 lb. of NIX at the time of tillivating the middle of the rows supplemented with 3 applications each of 10 lb. of CIPC per acre in the form of pellets also gave good weed control and did not affect yield. [From authors' summary.]—Everglades Exp. Stat., Belle Glade, Fla.

3673. ANON.
Aplicaciones de herbicídas en siembras de cebolla. **(Applications of herbicides to onions.)**
Not. agric. Serv. Shell Agric. Venezuela, 1955, **1**(6): 1-3, illus.

Weed control in onions in Venezuela was satisfactory when 45%-active chloro-IPC at a rate of 12 l. in 300–400 l. of water per ha. was applied three times after transplanting, when the weeds were not higher than 1 cm. Onion yields were reduced by CMU, especially when this was applied before transplanting.

3674. MOORE, J. F.
The efficiency of weed control with certain herbicides, and their effect on growth and yield of cannery spinach.
Proc. Amer. Soc. hort. Sci., 1955, **66**: 293-7, bibl. 5.

Efficient control of smartweed, chickweed and annual grasses was given by 4 lb. IPC or 1 lb. 3-chloro IPC in 25 gal. water per acre, but control of lambs-quarters, redroot and wild mustard was less satisfactory. Most of the herbicides tested gave better weed control in autumn than in spring crops of spinach. Spinach tolerated up to about 10 lb. per acre actual IPC without yield reduction. Treatment with pentachlorophenol, sodium isopropyl xanthate or calcium cyanamide proved less efficient than treatment with IPC or 3-chloro IPC under the conditions of these tests.—W. Wash. Exp. Stat., Puyallup.

3675. LACHMAN, W. H.
Weed control in butternut squash—1955.
Proc. 10th annu. Mtg N.E. Weed Control Conf., 1956, pp. 161-4, bibl. 3.

Dinoseb (amine) at 3–6 lb./ac. as pre-emergence application was not injurious to butternut squash. Experiments indicate that seed should be sown at a depth of 1 in.—*Weed Abstr.*, **5**, No. 493.

3676. WARREN, G. F.
Weed control in transplanted tomatoes.
Proc. 12th annu. Mtg N. centr. Weed Control Conf., 1955, p. 55.

Two years' experiments on the effect of DU at 4 and 8 lb./ac. and Natrin at 2 and 4 lb./ac. both in 50 gal. water applied to tomato plants 3–4 days after planting are described. Both herbicides appeared promising for weed control; Natrin controlled more weed species but had a smaller margin of safety for tomatoes than DU. At 4 lb./ac. DU gave excellent control of *Digitaria sanguinalis* and *Setaria*. It controlled neither *Mollugo verticillata* nor *Ambrosia artemisiifolia*.—*Weed Abstr.*, **5**, No. 938.

3677. RIES, S. K., AND GRIGSBY, B. H.
The post-emergence application of herbicides to tomatoes at different times and locations.
Proc. 12th annu. Mtg N. centr. Weed Control Conf., 1955, pp. 55-6, bibl. 9.

Tomatoes grown on two sites in Michigan were treated with Natrin at 2 and 4 lb./ac., CMU at 0·5 and 1 lb./ac. and 2-methyl-4-chlorophenoxyethyl sulphate at 2 and 4 lb./ac. when the first fruit clusters were set and the plants were in full bloom. All treatments except CMU at 0·5 lb./ac. on one site reduced the yield of marketable tomatoes.—*Weed Abstr.*, **5**, No. 939.

3678. MENGES, R. M., AND ALDRICH, R. J.
The effect of 2,4,5-trichlorophenoxyethyl sulphate and its diethanolamine derivative on the quality of tomato fruit.
Proc. 10th annu. Mtg N.E. Weed Control Conf., 1956, pp. 114-15, bibl. 1.

Natrin and its diethanolamine derivative were applied to tomatoes at early blossom stage at 2·5 and 5 lb./ac. The higher rate of both compounds significantly increased total N but decreased total acid; the 2·5 lb. rate had no effect on either. All treatments except 5 lb. of the diethanolamine decreased P. No treatment had any significant effect on total carbohydrates, K or percentage of dry matter. Natrin at 3 and 6 lb./ac. caused increased fruit cracking, but this was only significant at the higher rate; the higher rate also caused significantly higher incidence of blossom end rot.—*Weed Abstr.*, **5**, No. 482.

3679. DANIELSON, L. L.
Effect of granular herbicides on yields of tomatoes and sweet potatoes.
Proc. 10th annu. Mtg N.E. Weed Control Conf., 1956, pp. 116-21, bibl. 4.

These experiments compare granular and spray application of herbicides. CIPS±SES, dalapon, Natrin and CMU were applied to tomatoes (var. Rutgers) at early fruiting stage. There was little difference between granular and spray formulations of CIPC±SES, Natrin and CMU; dalapon was very significantly less toxic in granular form. In a second experiment CIPC 2 lb./a. and Natrin 4 lb./a. were applied to tomatoes (var. Rutgers, Valiant and Waltham Trellis No. 22) at early fruiting stage. CIPC was non-injurious, but at 2 locations out of 10 Natrin produced severe injury (symptoms resembling 2,4-D injury) which was thought to be due to poor nutrient status.—From *Weed Abstr.*, **5**, No. 483.

3680. ZEDLER, R. J.
Suggestions for using experimental herbicide Natrin 80S in tomatoes.
Proc. 10th annu. Mtg N.E. Weed Control Conf., 1956, pp. 122-3.

On the basis of 2 years' work it is suggested that Natrin should be applied for weed control in tomatoes at up to 3 lb./ac. on very light soil and up to 4 lb./ac. on heavy soil when the tomatoes are making vigorous growth and the soil is adequately moist.—From *Weed Abstr.*, **5**, No. 484. [See also *H.A.*, 26: 514.]

3681. TAYLOR, G. S.
Tobacco seedbed treatments for control of weeds and soil-borne pathogens.
From abstr. in *Phytopathology*, 1956, **46**: 242.

Steam, methyl bromide, Vapam (sodium methyldithiocarbamate), allyl alcohol and chloropicrin were compared. Vapam appeared promising as an easily applied fungicidal/herbicidal treatment.

Biological control measures.

3682. Smith, J. M.
Notes on biological control of weeds in Canada in 1955.
Proc. 8th west. Canad. Weed Control Conf., 1955, Regina, Sask., pp. 65-65a.

Notes on the control [in Canada and other countries] of *Linaria vulgaris* by a grey weevil (*Gymnetron antirrhini*), *Lantana camara* by several insects, *Cactus* spp. by a moth (*Cactoblastis cactorum*), *Clidemia hirta* D. Don. by a species of thrips, *Cordia macrostachya* (Jacq.) R. and S. by the leaf-eating beetle (*Schematiza cordiae*) and *Hypericum perforatum* by two chrysomelid beetles (*Chrysolina gemmelata* and *C. hyperici*), a root-boring buprestid beetle (*Agrilus hyperici*) and a leaf-gall-forming midge (*Zeuxidiplosis giardi*).—*Weed Abstr.*, **5**, No. 751.

3683. Smith, J. M.
Biological control of weeds.
From abstr. in *Proc. 9th Mtg west. Sect. nat. Weed Cttee, 1955*, Regina, Sask., p. 15.

Mention is made of the control of *Lantana camara* in Australia by *Cactoblastis cactorum*; *Clidemia hirta* in Fiji by a species of thrips; *Ulex* spp. in New Zealand by a seed weevil from England; *Artemisia arbuscula* in Mauritius by a beetle; and *Hypericum perforatum* [in Canada] by the beetles *Chrysolina gemellata*, *C. hyperici*, *Agrilus hyperici* and *Zeuxidiplosis giardi*.—From *Weed Abstr.*, **5**, No. 760.

Particular herbicides and control methods.

(*See also* 3693f, g, l, 3957.)

3684. Fletcher, W. W., and Raymond, J. C.
Toxicity and breakdown of "hormone" herbicides.
Nature, 1956, **178**: 151-2, bibl. 3.

White clover was the test plant in a study of the relative toxicity and the breakdown in the soil of the following hormone herbicides when applied to the rooting medium: 2,4-D, 2,4,5-T, MCPA, 2,4,DB, MCPB.—West of Scotland agric. Coll.

3685. Friesen, G.
Problems in the use of weed control chemicals.
Proc. 8th west. Canad. Weed Control Conf., 1955, Regina, Sask., pp. 33-9, bibl. 11.

The main problem considered is the damage caused to susceptible plants through drift or volatilization of herbicides (MCPA, 2,4-D and 2,4,5-T) and the factors affecting this, particularly droplet size.—*Weed Abstr.*, **5**, No. 746.

3686. Hay, J. R.
Present status of translocation investigations.
Proc. 9th Mtg west. Sect. nat. Weed Cttee, 1955, Regina, Sask., pp. 20-2.

An account of translocation studies with 2,4-D in the bean and a woody plant (*Dichrostachys nutans*). Breakdown following leaf application was found to be extremely rapid. Toxic amounts were in general not translocated down to the root and the evidence suggested that the mechanism responsible for this movement is disrupted by the high concentration.—*Weed Abstr.*, **5**, No. 762. [See also *H.A.*, 26: 56.]

3687. Wort, D. J.
The foliar application of nutrients with 2,4-D.
Proc. 9th Mtg west. Sect. nat. Weed Cttee, 1955, Regina, Sask., pp. 22-8.

Experiments were carried out in 1954 involving the application of various elements, in particular Fe, after, or as part of, a 2,4-D spray. [For an earlier report see *H.A.*, 25: 479.] The test plants were flax, wheat, buckwheat and stinkweed (*Thlaspi arvense*). With most treatments some degree of protection of the crop plants, but not of the weed, was obtained. Work in 1955 involved the application of "Lea Feeder" dust (2,4-D+Fe+Mn+B+Zn+Cu in talc), 2,4-D in talc, the 5 minerals in talc and the talc dust alone to wheat, flax, sugar beet, potatoes and bush beans. Again some measure of protection was generally afforded by the use of the composite 2,4-D dust. Results are given in some detail, and further work along the same lines is advocated.—From *Weed Abstr.*, **5**, No. 763.

3688. Williams, M. C., Slife, F. W., and Hanson, J. B.
Absorption and translocation of radio-active 2,4-D in certain weed species.
Proc. 12th annu. Mtg N. centr. Weed Control Conf., 1955, pp. 10-11.

In preliminary experiments on 3 species *Xanthium commune* was found to be very susceptible to 2,4-D (amine), *Datura stramonium* less so and *Sicyos angulatus* comparatively resistant. Later experiments on the application of C^{14} labelled 2,4-D to these 3 species involving analyses and radio-autography showed that the less susceptible plants contained equal or greater amounts of 2,4-D than did *X. commune*. It was found that age at the time of treatment was of little importance if the plant was susceptible, but that tolerance among the resistant species tended to increase with age.—From *Weed Abstr.*, **5**, No. 897.

3689. Chadwick, L. C., and Chambers, W. D.
Elimination of vegetation with TCA and dalapon.
Proc. 12th annu. Mtg N. centr. Weed Control Conf., 1955, p. 57.

Dalapon at 10 and 20 lb./ac. was considered better than TCA at 20 or 35 lb./ac. for the control of broadleaf weeds and retardation of grasses. *Plantago* spp. was not controlled by TCA or dalapon. There was no injury to *Euonymus fortuni vegetus* from TCA at 20 lb./ac. Drift of TCA and dalapon caused no injury on *Sophora japonica*, *Philadelphus virginalis* or *Laburnum anagyroides* and only slight browning of *Acer plantanoides*.—*Weed Abstr.*, **5**, No. 940.

3690. Warden, R. L., and Davidson, J. H.
Performance of erbon for extended vegetation control in the North Central States.
Proc. 12th annu. Mtg N. centr. Weed Control Conf., 1955, pp. 62-3.

From extensive tests during 1955 it is considered that seasonal control of average grass and broadleaf vegetation required 120-160 lb./ac. of erbon (2-(2,4,5-trichlorophenoxy)ethyl-2,2-dichloropropionate. For maximum effectiveness it should be applied in late spring or early summer when vegetation is growing vigorously and light rainfall is probable. Species less readily controlled by erbon include *Cirsium arvense*, *Plantago* spp. and *Rumex* spp.—*Weed Abstr.*, **5**, No. 948.

3691. Chadwick, L. C., Barker, P. A., and Chambers, W. D.
Soil sterilization with Vapam and sodium chlorate.
From abstr. in *Proc. 12th annu. Mtg N. centr. Weed Control Conf., 1955*, p. 57.

Sodium chlorate at 1 lb./100 sq, ft. and Vapam (a solution of sodium-N-methyl dithiocarbamate) at 1 and 2 pt./100 sq. ft. were applied to unplanted lath house beds and field areas where nursery stock was to be placed. Part of each treated area was then covered with 1·5 in. of crushed limestone. All areas were free of vegetation for at least 4 weeks.—*Weed Abstr.*, **5**, No. 942.

3692. Liljedahl, J. B.
Weed control by mechanical energy as a pre-emergence soil treatment.
Diss. Abstr., 1956, **16**: 719, being *Publ.* 15673 of 106 pp.

A field machine was devised to process by centrifugal force a strip of soil $\frac{3}{4}$ in. deep by 5 in. wide before sowing. The soil was fed into the centre of an impeller which threw the soil against an impact plate and from there it was directed back on to the sown seed. In greenhouse tests using muck soil there was a significant reduction in weed population at low impeller speeds of 1,500 r.p.m., and a significant increase in weed population at high speeds above 2,500 r.p.m. In field tests no significant increase or decrease in weed population resulted in muck or mineral soils.—Mich. St. Univ.

Noted.

3693.

a Abel, A. L.
Controlling perennial grasses by combined operations.
Agric. Rev., 1956, **2**: 32-7, bibl. 7, illus.
Especially by spraying with TCA plus cultivation.

b Anon.
Herbicidas en caña. **(Herbicides for sugar cane.)**
Not. agric. Serv. Shell Agric. Venezuela, 1955, **1**(4): 1-3, illus.
Directions for applying 2,4-D ester, CMU and a mixture of TCA with 2,4-D.

c Benitez Bejarano, A.
Destrucción de la "salvinia" en Ceilán. **(Control of *Salvinia auriculata* in Ceylon.)**
Shell Mag., March 1955, adapted in *Agric. trop. Bogotá*, 1955, **11**: 785-8, illus.
With Shell Herbicide No. 30 in waterways.

d Chappell, W. E.
Some effects of herbicides used in apple orchards on fruit quality.
Proc. 10th annu. Mtg N.E. Weed Control Conf., 1956, pp. 199-201.
Weed Abstr., **5**, No. 502.

e Freeman, J. A.
Chemicals for weed control in horticultural crops.
Proc. 8th west. Canad. Weed Control Conf., 1955, Regina, Sask., pp. 27-33.
From *Weed Abstr.*, **5**, No. 745.

f Gallagher, —., and Beatty, —.
Disodium methyl arsonate field tests—summer, 1955.
Proc. 10th annu, Mtg N.E. Weed Control Conf., 1956, pp. 73-6.
Effects of the material on weeds and lawn grass species.—From *Weed Abstr.*, **5**, No. 474.

g Helson, V. A., and Minshall, W. H.
Effects of petroleum oils on the carbon dioxide output in respiration of parsnip and mustard.
Plant Physiol., 1956, **31**: 5-11, bibl. 12.
Accounting for their selective herbicidal action.

h Montgomery, D.
Borate-containing herbicides.
Pestic. Abstr. News Summ., 1956, **2**: 87-91, bibl. 10.

i Orth, H.
Neuere Erfahrungen über Unkrautbekämpfung in einigen Gemüsekulturen. **(New experience in weed control in some vegetable crops.)**
Mitt. biol. Bundesanst. Berlin-Dahlem, 1956, Heft 85, pp. 194-7.
In onions, peas, carrots and asparagus.

j Playfair, L.
Control of woody plants.
Res. Rep. nat. Weed Cttee (*west. Sect.*), *Canada, 1955*, Regina, Sask., pp. 79-80.
From *Weed Abstr.*, **5**, No. 561.

k Venkataramani, K. S.
The control of Imperata grass.
Plant. Chron., 1956, **51**: 293-4.
Malayan work on *I. cylindrica.*

l Wolfe, H. H., and Rasmussen, L. W.
A farm sprayer for weed control.
Ext. Misc. Publ. Wash. St. agric. Ext. Serv. **12**, revised 1955, pp. 16, illus.
Practical points.

m Wood, H. E.
Fifty years of weed control in Western Canada.
Proc. 8th west. Canad. Weed Control Conf., 1955, Regina, Sask., pp. 1-6.
Weed Abstr., **5**, No. 740.

VEGETABLES, TEMPERATE, TROPICAL AND GLASSHOUSE.

General.

(*See also* 3237, 3248, 3250, 3263, 3264, 3284, 3290, 3293, 3298, 3303, 3311, 3315a, 3316g, 3583, 3594, 3596, 3650-3653, 3855f, o-q, s, y, 3856a, c, h, o, t, z, 4095, 4261, 4288, 4292, 4293, 4294c.)

3694. Philp, J., and Horne, F. R.
Breeding and testing of improved varieties of vegetables.
Fruit & Vegetables, being *Suppl. FATIS Rev.*, 1956, pp. 7-10, illus.

A discussion of the salient features which determine work on the breeding and testing of different vegetables in Great Britain.

3695. N.I.A.B.
Guide to varieties of field and vegetable crops under trial, observations and propagation 1956 [at the National Institute of Agricultural Botany, Cambridge], pp. 80.

Horticultural crops submitted to trials of various natures include french dwarf and runner beans, brussels sprouts, cabbages, carrots, cauliflowers, lettuce, mangels, onions, garden peas, poppies, swedes, outdoor tomatoes and topine and Russian comfrey. As regards topine the only entry is the statement that topine and commercial artichoke observation plots were planted on 7 April 1956. Russian comfrey trials were started with 8 selections in April 1956 and observation plots were established at the same date. It is noted that "observation plots" are unreplicated and are not normally harvested for yield, whereas "trials" are replicated in a statistical layout and normally provide yield data. Very brief explanatory notes are given on particular trials.

3696. Gumpenstein (Karner, L.).
Ergebnisse der Gemüsesortenversuche des Jahres 1953, des Jahres 1954 u. des Jahres 1955. **(Results of varietal and other trials with vegetables at Gumpenstein in the years 1953, 1954 and 1955.)**
Versuchsergebnisse der Bundesversuchsanstalt für alpenländische Landwirtschaft Gumpenstein, Hft. 29, 30 & 31, 1955, pp. 25, 26 & 47 respectively.

In each report of the different trials an introductory note on development is followed by climatic data and then by tabulated results of trials with named varieties of particular vegetables or drug plants. In all reports brassicas, peas, beans, lettuces, carrots, radishes and oil poppies appear, and in that for 1955 details appear on 25 culinary or drug plants which are now for the first time being tested under alpine conditions in Austria.

3697. Anon.
Introducción de variedades de hortalizas en los valles de Aragua. **(Introduction of vegetable varieties in the valleys of Aragua [Venezuela].)**
Not. agric. Serv. Shell Agric. Venezuela, 1955, **1**(5): 1-3, illus.

Brief information is given on variety trials with garlic, leek, artichoke, eggplant, onion, celery, cauliflower, spinach, lettuce, melon, red pepper, cabbage, tomato and carrot.

3698. Khan, A. W., and Chughtai, I. D.
Nutritive studies of food-stuffs: common vegetables.
From abstr. in *Proc. 6th Pakistan Sci. Conf., Karachi, 1954, Part III*, pp. 181-2.

Analyses were made on 50 vegetables to determine their contents of moisture, proteins, fat, ash, crude fibre, Ca, P and Fe. Carbohydrate and calorific values were also calculated.

3699. Alkmaar.
1e Jaarverslag 1954–1955 Proefstation voor de Groenteteelt in de Volle Grond in Nederland. ***(First Annual Report 1954-1955 of the Experiment Station for Vegetable Growing in the Open in the Netherlands)***, 1956, pp. 55, illus.

The official opening of the Experiment Station at Alkmaar took place in November 1953. The station aims at serving the smallholders of North Holland which is an important region for open-air vegetable growing. *Soils and manures:* long-term experiments are described. *Breeding* of beans, peas, cucumbers and tomatoes, and vegetable variety trials. *Cultural measures:* vernalization of beetroot, turnip and brassica seeds; the effect of storage temperature on offset formation and yield of shallots; maleic hydrazide treatment of lettuce, spinach and endive. *Pests and diseases:* endive fire and peppermint rust; lettuce mosaic and white cabbage banding; studies on biology and control of cabbage root fly and carrot fly; weed control in beetroot, onions, chicory and carrots.

3700. Chapman, C. I., and others.
Vegetable section.
A.R. Luddington exp. Hort. Stat. 1955, 1956, pp. 19-41.

Work in progress includes: N.I.A.B. variety trials with onions, lettuces, carrots, brassicas and sweet corn; reduction of cauliflower mosaic in seed-beds by cereal barriers: cabbage root fly control; asparagus spacing; trials of pre-emergence herbicides for vegetables; a taint experiment with gamma BHC and aldrin applied to cabbages, potatoes and carrots; irrigation regimes for rotations; manuring and nutrition experiments.

3701. Hovadík, A.
O možnosti bakterisace zelenin azotobakterem. **(The possibility of treating vegetables with azotobacter.)** [English, Russian and German summaries ½ p. each.]
Sborn. čsl. Akad. Zeměd., 1956, **29**: 277-88, bibl. 9.

Results of laboratory experiments and field observations show that inoculation of cabbage seed with azotobacter had a favourable effect on early plant growth, root development and final yields. In field peas treated with a combination of azotobacteria, nodule bacteria and phosphobacteria gave higher yields and an indication of higher ascorbic acid content than the controls or those treated with only one type of bacteria. Azotobacter treatment of lettuce was inconclusive, but in preliminary field trials inoculated seed of broccoli, marrow, pepper and celery gave yield increases of from 14 to 32%.

3702. NESTEROVA, E. I., GOLIKOV, V. G., AND NESTEROVA, G. N.
The improvement of the nutrient composition of peat-compost pots by bacterization. [Russian.]
Doklady vsesojuz. Akad. seljsk. Nauk, 1956, **21**(2): 43-8.

Cultures of azotobacter and also of unidentified bacteria which decompose $Ca_3(PO_4)_2$ were introduced into compost made from peat, FYM and ground rock phosphate used for soil blocks. The bacteria resulted in an increased release of nutrients in the soil blocks, and this was reflected in improved growth made by cauliflower seedlings raised in them. The most pronounced response in terms of earliness occurred in soil blocks made from lowland peat treated with phosphate-decomposing bacteria.

3703. KOPETZ, L. M.
Untersuchungen über die Anzucht von Jungpflanzen. **(Experiments on the raising of young plants.)**
Bodenkultur, 1956, **8**: 333-48, bibl. 7, illus.

Cultivation experiments by the author and others have been carried out with savoy, kohl-rabi, tomato, lettuce, paprika and cabbage seedlings. Pricking out after 5 or 9 days' growth resulted in less growth check than pricking out later. Plants from a direct sowing showed better root and shoot growth than plants which had been pricked out. Dry weights of root and shoot were highest in plants sown thickly and pricked out after 4 days; growth from thinner sowings and later pricking out was less good. Plant development was better in soil blocks than in a hot bed or in clay pots. Young plants grown in dry soil (20% water capacity) were shorter, had lower water contents and higher P and K contents than plants raised in soil at 80% water capacity. After planting out in favourable conditions growth and yields of "dry" plants were better than those of "moist" plants, especially in the case of lettuce and kohl-rabi.—Inst. PflB. PflZucht., Hochsch. Bodenkultur, Vienna.

3704. WINDHAM, S. L.
The influence of various levels of calcium, potassium, and magnesium in the soil on the absorption and yield response to potassium and magnesium by seventeen vegetable crops.
Diss. Abstr., 1956, **16**: 427, being *Publ.* 15904 of 106 pp.

Onions, cabbage, cauliflowers, peas, lima beans, snap beans, beets, spinach, celery, carrots, sweet corn, tomatoes, potatoes, muskmelons, cucumbers, squashes and lettices were grown under all combinations of 3 pH levels, 3 K levels and 2 Mg levels. Marketable yields and total plant growth were recorded and samples were collected for chemical analyses as each crop reached maturity. Potassium was the dominant ion and occurred in greater concentrations than Mg in every crop. In most crops wide variations in the percentage Mg or K were not reflected in marked differences in marketable yields; relatively high K concentrations in spinach and beets and relatively high Mg concentrations in beets were associated with maximum yields. The K requirements of snap beans, tomatoes and muskmelons were greater at pH 6·5 than at pH 5·5. Marketable yields of celery, tomatoes, muskmelons, snap beans and squash from medium K plots were significantly greater than yields from low K plots. Magnesium significantly increased beet yields and decreased carrot yields, but had little effect on yields of other crops. Carrots removed 3 times the average quantity of K removed by all crops. At pH 6·5 the quantity of K removed by beet, spinach, celery and carrots was significantly greater than at pH 5·5. Magnesium applications significantly increased the Mg removed by lima beans, beet, spinach, celery, onions, cabbages and carrots. High K significantly reduced the amount of Mg removed by lima beans, and liming significantly affected the amount of Mg removed by lima beans, beet, spinach, celery and carrots.—Mich. St. Univ.

3705. GEISSLER, T.
Einige Untersuchungen über die Chloridverträglichkeit verschiedener Gemüsearten. **(Some studies on chloride tolerance of several vegetable crops.)**
Arch. Gartenb., 1955, **3**: 316-25, bibl. 8, illus.

In pot experiments increasing doses of K as sulphate or chloride were given to dwarf beans, carrots and leeks. Beans receiving chloride showed acute toxicity symptoms. Carrot root weight was lower in the chloride series than in the sulphate series; in both series increasing potash levels resulted in increased yields. Yields of leeks were increased by chloride applications in comparison with sulphate applications; yields also increased with increasing K_2O levels, differences being more marked in the chloride series.—Inst. Gartenb., Grossbeeren.

3706. DUNN, S.
Influence of lignin and other waste materials on plant growth. [Spanish summary 1 p.]
Lilloa, 1953, **27**: 49-73, bibl. 7.

Finely divided lignin and other colloidal materials were added to greenhouse cultures in which tomato and other plants were grown. The added materials were without effect in water or gravel cultures but they improved growth in fine sand. The improvement is considered to be due to increased surface contact between root hairs and sand particles. The addition of wood-hydrolysis lignin, lignin plus sulphur, peat or rotten wood to outdoor soil cultures resulted in certain growth improvements in tomatoes and onions and in following crops of tomatoes and beans, although the average differences were not significant. The benefit of organic additions was greater under outdoor than under greenhouse conditions. Shredded bark mixed with soil in which tomatoes were grown appeared to have some value in minimizing the toxic effects of high levels of nutrient salts in the soil. Application of distillery waste to soil in which lettuce, radish and tomato were grown gave no benefit. There were indications that the addition of well-composted sawdust to sand or soil cultures might increase yields.—N.H. engng Exp. Stat.

3707. GILBERT, J. C.
Soil mulches of local materials.
Hawaii Fm Sci., 1956, **4**(4): 4-5, illus.

The results of mulching vegetable crops, including tomatoes, cucumbers, lettuce and green beans, with sugar cane bagasse or dried napier grass are discussed. The latter blew away easily and did not prove satisfactory except in orchards when it was not chopped up. Sugar cane bagasse both fresh and composted proved a satisfactory material, increasing yields and controlling the growth of weeds. Methods of irrigating mulched fields and the effects of mulching on Mn toxicity and on pests and diseases are discussed. J.R.L.

3708. Cripps, G. S.

Is molybdenum deficiency reducing your yields?

Amer. Veg. Gr, 1956, **4**(4): 22-4, illus.

Notes on the occurrence and correction of Mo deficiency are followed by descriptions of deficiency symptoms in 17 vegetable crops.

3709. Krüger, K.

Untersuchungen über die Ursachen der Rieselmüdigkeit und Massnahmen zur Ertragssteigerung auf rieselmüdem Boden. **(Studies on the cause of sewage sickness and methods of increasing yields on "sewage-sick" soils.)**

Arch. Gartenb., 1955, **3**: 396-489, bibl. 333, illus.

Sewage sickness in irrigated soils is described and discussed; plants showing symptoms are markedly chlorotic, and yields are reduced. The disorder becomes apparent after abnormally high irrigation applications of sewage. Studies have indicated that it is not caused by deficiencies of macroelements, and probably not of microelements. No relation between soil reaction and sickness was found. Some toxic substance(s) released in the soil is probably the cause of the disorder. Calcium cyanamide gave the most favourable results in manurial trials, probably owing to its cyanamide content. Spinach growth on slightly sick soil was improved by calcium cyanamide applied at 100 kg. N/ha; the fertilizer should normally be applied 2–3 weeks before sowing. Liming, with calcium carbonate or calcium hydroxide, also resulted in yield improvements. Yields on sewage-sick soil were increased by applications of town waste, the active component being briquette ash. Organic manuring with 2 types of peat and filtered sewage had no beneficial effect. Relatively high applications of composted straw with calcium cyanamide resulted in improved yields. It is recommended that vegetables be transplanted with a ball of soil. Biological activity was lower in sick than in healthy soils. No effect of soil sterilization was observed. *Anthemis arvensis* and deadly nightshade were weed indicators of sewage-sick soils. Vegetables vary in tolerance to sewage sickness and careful selection of crop plants can help to reduce the effects.—Inst. Gartenb., Grossbeeren.

3710. Lecrenier, A., and Piquer, G.

Essais sur l'action des poussières de cimenterie sur la végétation. **(Tests on the effect of cement dust on plants.)**

Bull. hort. Liège, 1956, **11**: 56-8, bibl. 3.

Cement dust applied to the leaves of bean and tomato plants significantly reduced the yield of those plants. Earliness of yield in tomato was also affected.—Inst. agron. État, Gembloux.

3711. Kleščevič, N. F.

A substitute for bordeaux mixture. [Russian.]

Sad i Ogorod, 1956, No. 6, pp. 29-30.

A brief note stating that pyrites cinders are almost as effective against bacteriosis on cucumbers and a complex of diseases on tomatoes as bordeaux and are 10 to 15 times cheaper. A single application of the material at 2 centners per ha. on the plants increased tomato yields by 34% above those of the controls and improved fruit quality. The use of pyrites cinders for disease control on other crop plants including fruit trees is considered.

3712. Ehlers, M.

Zur vorbeugenden Bekämpfung von Wurzelfliegen bei Gemüse durch Saatgutbehandlung. **(Preventive control of root flies in vegetables by seed treatment.)**

Mitt. biol. Bundesanst. Berlin-Dahlem, 1956, Heft 85, pp. 151-4, bibl. 9.

Carrot fly: seed dressings with lindane, endrin, isodrin and dieldrin at 100 g./kg. carrot seed all gave effective control without affecting germination, growth or taste of carrots. *Onion fly:* lindane dressing inhibited growth of onions; dieldrin was superior to DDT in insecticidal effect and influence on germination; a 90% dieldrin coating material applied at 50 g./kg. seed had a persistent effect; endrin and isodrin had a similar effect to dieldrin, which was also effective in leek seed treatment; onion setts treated with 0·5% dieldrin suspension gave 51% higher yields than untreated onion setts. *Cabbage fly:* seed coating with a 90% dieldrin preparation at 30–50 g./100 g. seed markedly reduced fly attack; endrin and isodrin gave similar results.

3713. Bremer, H.

Der Stand der Bekämpfungsmöglichkeit von Gemüsefliegen. **(A review of the present position with regard to the control of vegetable flies.)** [English summary ¼ p.]

Z. PflKrankh., 1956, **63**: 259-66, bibl. 55.

A review of modern methods for controlling bean seed flies (*Phorbia platura* and *P. florilega*), onion fly (*P. antiqua*), cabbage flies (*P. brassicae* and *P. floralis*), carrot fly (*Psila rosae*) and asparagus fly (*Platyparea peociloptera*).

3714. Hallock, H. C., and Deen, O. T.

Greenhouse tests on control of the beet leafhopper.

J. econ. Ent., 1956, **49**: 123-6, bibl. 1, illus.

Thirty-three chemicals were compared in greenhouse tests in Idaho to determine their value for control of beet leafhopper, *Circulifer tenellus*, and protection of bean and sugar beet plants against curly top virus. Their phytotoxicity to snap beans was also observed. Although several of the materials gave good leafhopper control, only Bulan, Colorado 9, DDT, schradan and TDE showed as much as 80% reduction in curly top. Purified DDT, Bulan and Perthane were safe to use on beans when applied at 1·5 lb. per 100 gal., and some of the other materials at lower spray concentrations or as dusts were also harmless. In preliminary tests with 4 plant hormones NAA at 25 p.p.m. was safe on beans and reduced curly top. [For an earlier report on field trials see *H.A.*, 24: 3864.]

Brassicas.

(*See also* 3264, 3856d, x, 4129.)

3715. Johnson, A. G.
Spring cabbage varieties—their classification and performance.
A.R. nat. Veg. Res. Stat., Wellesbourne, for 1955, 1956, pp. 17-34, bibl. 1, illus.

A hundred varieties of British spring cabbage and similar foreign cabbages were grown and placed in 17 groups based on differences in maturity period, heart shape and other morphological characters. The varieties were grown in trials with 2 sowing dates, and data and observations on yield and performance are given.

3716. Valenta, M., Kutáček, M., and Icha, F.
Stanovení derivátů indolu v rostlinném materiálu I. Kolorimetrické stanovení askorbigenu a jeho obsahu v některých druzích zeleniny. (**Determination of indole derivatives in plant material. I. Colorimetric determination of ascorbigen and its content in some vegetables.**) [English and Russian summaries ½ p. each.]
Sborn. čsl. Akad. Zeměd., 1956, **29**: 193-202, bibl. 19.

The ascorbigen or bound L-ascorbic acid content of some crucifers varied from 6·0 mg./% in brussels sprouts to 21·6–28·0 mg./% in kale.

3717. Iacopini, P.
Osservazioni sulla moltiplicazione agamica del cavolo per talea foliare. (**Observations on vegetative propagation of cabbage by leaf cuttings.**) [English summary 11 lines.]
Riv. Ortoflorofruttic. ital., 1956, **40**: 145-55, bibl. 8, illus.

Cuttings of cauliflower and Savoy cabbage consisted of a piece of stem bearing a leaf with more than half the blade removed. Half the total number of each type were treated for 24 hours with 20 p.p.m. α-naphthalene acetic acid. On transference to sand 63% of treated and 49% of untreated cabbage cuttings produced roots and shoots and eventually grew into normal plants. Cauliflower cuttings rooted more readily than cabbage, but only 37% of treated and 21% of untreated ones produced both roots and shoots (probably owing to the absence of axillary buds). In those producing both, the roots withered before the shoots were developed and th eshoots died soon afterwards.

3718. Man, K. S., and Sandhu, B. S.
Studies on some cultural practices in cabbage production.
Indian J. Hort., 1955, **12**: 196-200, bibl. 3.

A field trial with Large Late Drumhead was carried out in two seasons on methods of culture. Frequent hoeings did not appear to be necessary for high yields, and 2 hoeings would seem to be sufficient. In 1949-50 there was little difference in seedlings planted on the flat and those planted on ridges. In 1950-51 seedlings planted on the flat gave better yields than those planted on ridges, and seedling mortality was lower.—Gov. agric. Coll., Ludhiana, Punjab.

3719. Manturova, I. M.
Foliar nutrition of cabbage in the north. [Russian.]
Sad i Ogorod, 1956, No. 5, pp. 23-4, bibl. 1.

Contrary to earlier results [see *H.A.*, 24: 3802] foliar applications of N to cabbage were not always better than soil applications. Under certain conditions, however, notably in the critical growth periods before heading and before maturation, the method shows great advantages. During prolonged rains 1% ammonium nitrate plus superphosphate applied 3–4 weeks before harvest increased the yield of saleable cabbage by 68%, but in fine weather better results were obtained with 1–3% ammonium nitrate alone.

3720. Man, K. S., and Sandhu, B. S.
On the nitrogen requirements of cabbage.
Indian J. Hort., 1956, **12**: 188-95, bibl. 4.

In a trial with Large Late Drumhead the optimum dose of N was about 150 lb. per acre. Precocity was also promoted at this level. Application of 200 lb./acre resulted in depressed yields. Better response was obtained from a combined application of farmyard manure and sulphate of ammonia than from separate applications of each.—Gov. agric. Coll., Ludhiana, Punjab.

3721. Hewitt, E. J., Fisher, E. G., and Candela, M. I.
Factors affecting the activity of nitrate reductase in cauliflower plants.
A.R. Long Ashton agric. hort. Res. Stat. for 1955, 1956, pp. 202-10, bibl. 8.

Results of experimental work on Majestic cauliflowers in sand culture are discussed under the following headings: Distribution of net activity; effects of nitrogen source and molybdenum level; effect of molybdenum infiltration on nitrate reductase and acid phosphatase activities.

3722. Hewitt, E. J.
The destruction of ascorbic acid by tissue preparations of cauliflower grown with different nitrogen and molybdenum supplies.
A.R. Long Ashton agric. hort. Res. Stat. for 1955, 1956, pp. 211-20, bibl. 13.

The work was done on Majestic cauliflowers growing in sand culture at normal or deficiency levels of molybdenum with nitrogen given as nitrate, nitrite or ammonium sulphate. Preliminary results are compatible with the idea that ascorbic acid is more rapidly destroyed *in vitro* by preparations from molybdenum deficient than from normal tissues and the fact that the steady-state concentrations of ascorbic acid are lower in tissues of molybdenum-deficient than in those of normal plants.

3723. Plant, W.
The effects of molybdenum deficiency and mineral toxicities on crops in acid soils.
J. hort. Sci., 1956, **31**: 163-76, bibl. 10, illus.

An account is given of field trials in which cauliflower, other brassicas and lettuce were grown for a varying number of years on 3 acid soils treated with limestone, dolomite, gypsum and sodium molybdate. The symptoms developed by the test crops are described and depicted, and analytical data for leaf samples are given. On the least acid soil (pH 4·8) only Mo deficiency was apparent; on the soil of intermediate pH (4·6) a mixed syndrome of Mo deficiency and Mn toxicity appeared, whilst on the most acid soil (pH 4·0) the syndrome also included Al toxicity. When cauliflower and lettuce were grown on the same soil for 4 consecutive years, a gradual fall in soil pH led to a change from Mo deficiency to a syndrome of Mo deficiency and Mn toxicity. Applications of lime and dolomite were equally effective in correcting both Mo deficiency and mineral toxicities. While gypsum reduced the uptake of Mn from 2 soils derived from Old Red Sandstone and tended to alleviate Mo deficiency, it had the opposite effect on a soil derived from the Lower Greensand. Soil treatment with sodium molybdate was completely effective only on the least acid soil but an unexpectedly high yield of cauliflowers showing symptoms of Mn toxicity was obtained on the soil of intermediate pH by spraying seedlings with molybdate in the seed bed. Mo deficiency was characterized by a high level of nitrate and a low level of ascorbic acid in the leaves of some brassicas but not of all. [From author's summary].—Long Ashton Res. Stat. [See also *H.A.*, 26: 666.]

3724. ROBINSON, D. B., AND CAMPBELL, J. E.
Whiptail of cauliflower in Prince Edward Island.
Canad. J. agric. Sci., 1956, **36**: 241-4, bibl. 9, illus.

Whiptail is common in P.E.I., where it is invariably associated with very acid soils which have received heavy dressings of commercial fertilizer. Applications of 6 to 16 oz. Mo per acre to the soil or of 1 to 12 oz. per acre on foliage gave satisfactory control.—Sci. Serv. Lab., Charlottetown.

3725. BEDDALL, J. L., AND QUARRELL, C. P.
Whiptail of early cauliflowers.
Agriculture, Lond., 1956, **63**: 114-18, bibl. 3.

The results of observation trials in Worcestershire suggest that heavy dressings of fertilizers on acid soils will accentuate whip-tail in early cauliflower when molybdenum is deficient in the soil or is not available to the plants in sufficient amounts. [Authors' summary.]

3726. BROADBENT, L.
Brassica virus diseases.
Agriculture, Lond., 1956, **63**: 69-72.

There are three important virus diseases of brassica crops in Britain, cauliflower mosaic, cabbage black ring spot and turnip yellow mosaic. The first two are spread by aphids and the last by flea beetles. The crops can be protected by spraying the old crops to prevent mass movements of winged aphids, isolating seedbeds, planting seedbeds densely and selecting healthy seedlings for planting. Barrier crops of cereals may be grown around seedbeds and tolerant varieties will reduce the loss to growers.

3727. NATTI, J. J.
Influence of cauliflower mosaic and turnip mosaic viruses on yields of cabbage in New York State.
Plant Dis. Reptr, 1956, **40**: 591-5.

Seedbed inoculation with virus diseases reduced yields by 50 to 75%. Late season infections had no noticeable effect on yields.—N.Y. St. agric. Exp. Stat., Geneva.

3728. BUDZIER, H. H.
Über die Beeinflussung des Auftretens der Kohlhernie-Krankheit durch Kompostgaben. (**The effect of compost application on the occurrence of clubroot disease of cabbage.**) [English summary 11 lines.]
Z. PflKrankh., 1956, **63**: 257-9, bibl. 6.

In pot experiments using soil infected with *Plasmodiophora brassicae*, *Sinapis alba* was used as a test plant. The number of infected plants decreased as the proportion of compost included in the soil mixture was increased.—Inst. Phytopath. u. PflSch., Univ. Rostock.

3729. JARY, S. G.
The control of pests of brassica seed crops.
J. Sci. Food Agric., 1956, **7**(Suppl.): 33-6, bibl. 8.

Three major pests and 2 of lesser importance attacking brassica crops in their second year are described. Initially dusts were used for their control, but these have been replaced by DDT emulsions which give adequate control of pollen beetle, though they do not give satisfactory reductions of weevil populations.

3730. NAGELS, W.
Potgrondbehandeling ter bestrijding van koolvlieg. (**Treatment of potting soil for control of cabbage root fly.**) [English summary ½ p.]
Meded. Dir. Tuinb., 1956, **19**: 349-55, illus.

Applications of various insecticides to potting soil were compared in cabbage root fly control experiments. Parathion was not sufficiently persistent and chlordane tended to inhibit growth. Lindane dust (0·7%) at a rate of 3 kg./m³ soil was less effective than aldrin or dieldrin. The most satisfactory control was obtained with 25% aldrin applied at ½ l. or ¼ kg./m³ of soil.

3731. FRÖHLICH, G.
Zur Biologie und Bekämpfung der Kohlschoten-Gallmücke (*Dasyneura brassicae* Winn). (**Biology and control of the cabbage gall-midge.**)
NachrBl. dtsch. PflSchDienst, Berlin, 1956, **10**: 123-8, bibl. 14.

Promising control of cabbage gall midge adults has been obtained with a toxaphene preparation, which is not toxic to bees.—Inst. Phytopath., Karl-Marx-Univ., Leipzig.

Celery.

(*See also* 3658, 3801, 3856r.)

3732. GOODMAN, O.
Methods of blanching celery with special reference to slug control.
J. Dep. Agric. Dublin 1954/55, **51**: 75-81.

Trials of different materials for the blanching of celery were carried out at Johnstown Castle Agricultural College in 1954. They showed that roofing felt and building paper were good substitutes for soil-blanching, especially when slugs were prevalent, and financially compared favourably with the use of soil. Concreting paper and subsoil paper were not so satisfactory.

3733. McLean, E. O.
Uptake of sodium and other cations by five crop species.
Soil Sci., 1956, **82**: 21-8, bibl. 7.

Celery and 4 field crops were grown for 50 days in gravel irrigated with ⅕ Hoagland solution. Cation activities and cation-exchange capacities were studied in electrodialysed roots. In a second (60-day) series the solution was modified by replacing ¼, ½ or ¾ of the K by Na. Contents of Na, K, Ca and Mg were determined in roots and tops. The cation-exchange capacity of the celery roots, in milliequivalents per 100 g., was 74·6 or much higher than that of any of the field crops studied. Na accumulation in roots and tops was also greatest in celery, which bonded Na more strongly than K. The root yield was nearly doubled by the first Na increment, but was reduced below that of the control by further increments. Uptake of Ca and Mg was depressed by the first Na increment.

3734. Crane, R. I., and Brendler, R. A.
Harvesting California celery for shed packing.
Veg. Crop Ser. Univ. Calif. **79**, 1955, pp. 4, bibl. 1.

Labour requirements are tabulated for various methods of root cutting, root trimming, stripping, topping, crating and loading. Machine root cutting was faster than hand cutting and an overall gain in output of 13 or 18% was obtained with 1-row and 2-row machine cutters respectively. No substantial differences in root damage were observed with the 2 methods. The use of a field conveyor increased the output of stripper-craters by 15%.

Cucurbits.

(*See also* 3251, 3297, 3659, 3675, 3833, 3855j, 3856g, w, y.)

3735. Jenkins, J. M., Jr.
Cucumber varieties.
Amer. Veg. Gr, 1956, **4**(4): 40.

In trials at the Horticultural Crops Research Station, Castle Hayne, N.C., Palomar, Stono and Marketer gave significantly higher yields in 1955 than the other cucumber varieties tested. The first 2 varieties are resistant to downy mildew. Ashley has also given good yields over a period of years, appears to have the highest mildew resistance and is recommended as an autumn crop.

3736. Crombie, W. M., and Comber, R.
Fat metabolism in germinating *Citrullus vulgaris*.
J. exp. Bot., 1956, **7**: 166-80, bibl. 49.

A column chromatographic technique, making possible identification and quantitative estimation of fatty acids, has been employed to study fat metabolism in *Citrullus vulgaris* during germination in the light. The results suggest a rapid removal of storage fat from the cotyledons and concomitant formation in small quantity of a typical leaf fat as the new photosynthetic function develops. [From authors' summary.]—Univ. Southampton.

3737. Meljnikova, A. A., and Sokolova, G. P.
The effect of foliar nutrition on the yield of cucumbers and beetroots. [Russian.]
Sad i Ogorod, 1956, No. 5, pp. 21-3.

A 1% solution of NPK applied to frame-grown cucumbers at the beginning of flowering and an 0·3% solution of KCl applied during fruiting increased yields by 10% and 8% respectively. A 4% solution of PK applied to beetroots 3 weeks before harvest increased yields by 13·6%.

3738. Uschdraweit, H. A., and Valentin, H.
Winterwirte des Gurkenmosaiks. (**Winter hosts of cucumber mosaic.**)
Angew. Bot., 1956, **30**: 73-9, bibl. 4.

An examination of perennial herbs revealed 61 new hosts of cucumber mosaic. In addition to these, winter annuals, biennials and shrubs were also found to be winter hosts. The roguing of affected plants is made difficult by the absence of characteristic symptoms.—Inst. f. gärtn. Virusforsch., biol. Bundesanst., Berlin-Dahlem.

3739. Williams, L. E., and Lockwood, J. L.
Control of bacterial wilt of cucumber by antibiotic sprays.
Plant Dis. Reptr, 1956, **40**: 479-82, bibl. 7.

In greenhouse tests bacterial wilt (*Erwinia tracheiphila*) was reduced by sprays of streptomycin or neomycin at 100 p.p.m. and of terramycin or penicillin at 500 p.p.m. when applied 24 hours before leaf-rub inoculations were made. Streptomycin (100 p.p.m.) and terramycin (500 p.p.m.) also reduced infections originating from hypodermic-injection inoculations. In the field bacterial wilt incidence was reduced by sprays of 100 p.p.m. streptomycin and 200 p.p.m. terramycin. Plots sprayed with 500 p.p.m. streptomycin showed a 25% increase in yield.—Ohio agric. Exp. Stat., Wooster.

3740. Epps, W. M.
An evaluation of fungicides for the control of diseases of cucumbers in South Carolina, 1946-1955.
Plant Dis. Reptr, 1956, **40**: 441-2.

None of the 25 fungicides tested gave adequate combined control of downy mildew, anthracnose and fruit rot. Maneb and zineb were the most effective and are recommended for use in South Carolina.—Clemson Coll. Truck Exp. Stat., Charleston, S.C.

3741. Rich, S.
Foliage fungicides plus glycerin for the chemotherapy of cucumber scab.
Plant Dis. Reptr, 1956, **40**: 620-1, bibl. 6.

Captan, zineb and streptomycin with and without added glycerin were sprayed on cucumber seedlings at the 2-leaf stage; after the third leaf had developed the plants were inoculated with *Cladosporium cucumerinum*. Zineb and captan showed significant chemotherapeutic activity. The addition of glycerin significantly improved the therapeutic action of zineb. The therapeutic activity of captan and streptomycin was improved non-significantly by the addition of glycerin. —Conn. agric. Exp. Stat., New Haven.

3742. Beecher, F. S.
Downy mildew on cucumbers and muskmelons.
Market Grs' J., 1956, **85**(6): 6, 8, illus.

In tests with various fungicides at the Plant Industry Station, Beltsville, a tank mixture of tribasic copper sulphate and zineb gave the best control of downy mildew on cucumbers and muskmelons. A mixture of 2–3 lb. fixed copper with 2 lb. zineb per 100 gal. spray is recommended, applications being made at weekly intervals.

3743. Revilla, M., V.
Control del oidium del melon, zapallo y pepino. **(Control of mildew of melon, squash and cucumber.)**
Bol. Est. exp. agric. La Molina 60, 1955, pp. 15, from abstr. in *Bol. inf. Café, Chinchina-Caldas*, 1956, 7: 10.

The best control of *Oidium ambrosiae* was given by karathane, either as a 1% dust or a 0·12% spray with spreader. Three applications at 10-day intervals gave economic control.

3744. Read, W. H., Hughes, J. T., and Smith, R. J.
Fungicides. (b) Glasshouse trials.
A.R. Cheshunt exp. Res. Stat. 1953, 1954, pp. 42-3. [Received 1956.]

Mildew on young cucumber plants, caused by *Erysiphe cichoracearum*, was eradicated by karathane at 0·05%, but slight yellowing of older leaves was observed. With 0·025% karathane mildew control was almost complete, and no phytotoxicity was apparent. In tests with several compounds none effectively eradicated the lesions produced on tomato plants by *Didymella lycopersici*.

3745. Read, W. H., Hughes, J. T., and Smith, R. J.
Fungicides.
A.R. Cheshunt exp. Res. Stat, 1954, 1956, pp. 39-41.

Derivatives of quinoxaline were tested for toxicity to spores of *Fusarium culmorum*. Only those compounds with a hydroquinoid system showed fungitoxic properties. Very good control of cucumber mildew was given by sprays of 4:6-dinitro-2-*sec*octylphenyl crotonate at 0·01%.

3746. Miller, L. A.
Insecticides and varietal resistance in the control of the squash vine borer, *Melittia cucurbitae* (Harr.), in southwestern Ontario.
Canad. J. agric. Sci., 1956, **36**: 309-13, bibl. 6.

In experiments on Golden Hubbard squash in 1952 and 1954, dusts of 2½% aldrin, 1 and 2½% dieldrin, 3% methoxychlor and 3% aerosolgrade DDT each gave excellent control of the squash vine borer. A 1% rotenone dust was moderately effective. Three applications, the first during the last week of June and the two others at 7- to 10-day intervals, were adequate. The dusts should be directed to the bases of the stems, where 85% of the eggs are laid. The insecticides were not phytotoxic under conditions of the experiment. Butternut pumpkin, Honey Cream watermelon, Iroquois muskmelon, Zucca melon, red-seeded citron and National Pickling and Straight 8 cucumbers were immune to borer attack. The relative susceptibility of 19 other varieties of cucurbits are tabulated.—Ent. Lab., Chatham, Ont.

3747. Harries, F. H., and Matsumori, H.
Tests of insecticides for control of cucumber beetles in Ohio.
J. econ. Ent., 1956, **49**: 131-3, bibl. 10.

From 1945 to 1952 many of the new insecticides were tested in Ohio against the striped cucumber beetle, *Acalymma vittata* (F.), and the spotted cucumber beetle, *Diabrotica undecimpunctata howardi* Barb. Laboratory tests showed that many of the insecticides were very toxic to both species. The relative effectiveness of the better insecticides was difficult to determine in field tests because of the moving habits of the insects, but many of them gave good control when used at strengths of 1 or 2%. The most effective materials were rotenone, lindane, EPN, dieldrin, aldrin, heptachlor, Bulan and DDT. [Authors' summary.]

3748. Ho, T.
The toxic effects of DDT and BHC dusts to the leaves of watermelon.
Taiwania, 1955, No. 6, pp. 79-84, bibl. 7, illus.

DDT dusts at 5% and 10% and BHC dusts at 0·5% and 1% caused chlorosis and affected the internal structure of watermelon leaves. The lower rate of each material is the minimum for insect control, thus these insecticides cannot be recommended for application to watermelon.

3749. Markov, V. M.
Maturity determination in watermelons by specific gravity. [Russian.]
Sad i Ogorod, 1956, No. 7, pp. 27-8.

It was established that the specific gravity of watermelons is as follows: unripe 0·99–0·96, ripe 0·95–0·90 and over-ripe 0·89–0·80. A table is given showing the diameter, circumference and volume and the corresponding weights of unripe, ripe and over-ripe fruits. For practical use a closely-graduated table, based on the one given here, should be constructed with the aid of which 2 people can determine the maturity of a watermelon in ½ minute.

3750. MacGillivray, J. H., Hedges, T. R., and Clemente, L. J.
Labor use for honey dew melon harvest.
Veg. Crops Ser. Univ. Calif., **72**, 1955, pp. 6, illus.

Harvesting by conveyor belt and by picking-bag loading was studied. The conveyor belt reduced labour costs and workers' fatigue, as well as setting the pace for work. In picking bag loading there is less equipment to break down or pay for, but there are several sources of waste, and the melons receive rougher treatment.

Legumes.

(*See also* 3246, 3247, 3259-3262, 3278, 3280, 3282, 3285, 3297, 3315b, e, t, 3595, 3659-3666, 3855b, i, l, n, u, 3856b, e, f, i, k-m, u, 4048.)

3751. Mateo Box, J. M.
Guisantes: variedades y cultivo. **(Peas: varieties and culture.)**
Manuales tec., Minist. Agric., Madrid, Ser. A **19**, 1955, pp. 187, bibl. 40, illus.

In this comprehensive manual on pea growing in Spain the subject is dealt with under the following headings:

(1) *Agricultural botany:* descriptions of the various organs and general agronomic characters of commercial types. (2) *Varieties:* classification, synonyms and descriptions of commercial varieties. (3) *Culture:* sowing, staking, harvesting, rotations, manuring, inoculation, etc. (4) *Seed* production and germination. (5) *Pests and diseases*: descriptions and control measures. (6) *Economic data* from the chief production areas in Spain.

3752. WARNOCK, S. J., AND HAGEDORN, D. J.
Germination and storage of pea (*Pisum sativum*) pollen.
Agron. J., 1956, **48**: 347-52, bibl. 13, illus.

The optimal pH for agar-sucrose germination media was 7·0 and the optimal composition was 1% agar with 15% sucrose. Addition of naphtheleneacetic acid at 1 p.p.m. was slightly favourable and at 10 p.p.m. distinctly adverse, but in the presence of yeast extract its harmful action was reduced. Comparison of three storage temperatures showed that the lowest (−5° C.) was the most favourable for storage of either loose pollen over saturated salt solutions or of pollen in flowers with uncontrolled humidity. Effectiveness of salts tested for control of humidity decreased in the order $MgCl_2.6H_2O > CaCl_2.6H_2O > NaNO_3$. Storage in flowers was the least satisfactory, a marked decrease in viability occurring from the end of the first week onwards. In one experiment pollen stored for 3 months at −5° C. over $MgCl_2.6H_2O$ was as viable as fresh pollen. Deterioration due to storage in flowers was manifested first in germination percentage and later in seed set. Failure to germinate on artificial media was no proof of loss of fertilizing power. Correlation coefficients were established as follows: 0·58 between germination and seed set; 0·51 between pollen-tube length and seed set; 0·86 between germination and tube length. It is concluded that germinability on artificial media is a simple and positive test for ability to set seed.

3753. TONIOLO, L.
Germinabilità, vitalità ed anormalità di germinazione in *Pisum sativum* e *Phaseolus vulgaris.* (**Germination viability and abnormal seedlings in *Pisum sativum* and *Phaseolus vulgaris.***) [English summary 5 lines.]
Ann. Sper. agrar., 1956, **10**: 923-56, bibl. 51, illus.

In general, a satisfactory correlation existed in both pea and French bean between germination rates in laboratory tests and those in the field. Laboratory techniques and types of abnormal germination are discussed. The tetrazolium test for viability gave good results with both species.

3754. DOWN, E. E., AND ANDERSEN, A. L.
Agronomic use of an X-ray-induced mutant.
Science, 1956, **124**: 223-4, bibl. 3.

X-ray-treated seed of Michelite Navy bean, a vine type, gave rise to a bush type mutant which matured earlier than Michelite and bred true. Crossing and selection of the progeny from this mutant resulted in an anthracnose-resistant bush variety which has been called Sanilac. The advantages of the new variety compared with Michelite are: (1) it is resistant to the alpha strain of the bean anthracnose fungus; (2) it is considerably less liable to injury by *Sclerotinia sclerotiorum*; (3) it ripens 6 days earlier; (4) because of its upright habit it withstands wet weather better and therefore has fewer discoloured beans. Sanilac is similar to Michelite in seed type, canning quality and resistance to common bean mosaic. More data are needed to determine whether it can be harvested by combine without pulling.—Mich. St. Univ., E. Lansing.

3755. HIGHKIN, H. R.
Temperature-induced variability in the growth and development of pea plants.
From abstr. in *Plant Physiol.*, 1956, **31** (Suppl.): iii.

Peas were grown at several constant temperatures for up to 9 generations. At all temperatures general plant vigour gradually decreased from the first to the fifth or sixth generation, and then maintained the same low level. After development for 5–7 generations at a constant temperature behaviour was not altered under varied day and night temperatures. An indication of an effect of the constant temperature on pollen parent was observed.—Calif. Inst. Technol., Pasadena, Calif.

3756. HODGSON, G. L., AND BLACKMAN, G. E.
An analysis of the influence of plant density on the growth of *Vicia faba*. 1. The influence of density on the pattern of development.
J. exp. Bot., 1956, **7**: 147-65, bibl. 23.

Over densities ranging from 11 to 67 plants per sq. m. seed production on an area basis tended to be maximal at 35–45 plants per sq. m. in the winter type and at the highest density for the spring type. Seed production was solely governed by the number of mature pods formed. The number of flowers per plant was more dependent on the number of inflorescences than on the number of flowers per inflorescence. Increasing the population diminished the number of nodes bearing inflorescences particularly in the upper part of the shoot, while the size of the inflorescence was decreased to a lesser extent. The number of flowers forming mature pods was very small (9–14%). The primary effect of increasing density was to depress the number of nodes on the lower half of the stems which produced mature pods. By the time the flowering stage was reached plant height was already correlated with density, more as a result of a change in internode length than of an alteration in the number of differentiated nodes; at maturity the differences in height were smaller owing to the greater number of nodes in the widely spaced plants. For a given density alterations in the distance between rows had little influence on development. The possible physiological factors responsible for the changing pattern of development brought about by varying density are discussed. [From authors' summary.]—Dep. Agric., Univ. Oxford.

3757. HAGEDORN, D. J., HOLM, L. G., AND TORRIE, J. H.
Yield-quality relationships as influenced by maturity of canning peas.
Res. Bull. Wis. agric. Exp. Stat. **187**, 1955, pp. 15, bibl. 7.

Alaska and Wisconsin Perfection canning peas were tested in 1950–1953 in trials in Southern Wisconsin. Commercial type practice was observed so far as was possible. The relationship between yield and maturity as estimated by tenderometer readings varied greatly from field to field. Thus the average increase in yield in pounds per acre for each unit increase in tenderometer reading was 29·6 for Alaska and 27·9 for Wisconsin Perfection, but the range was 15·6 to 44·6 and 14·7 to 47·1 pounds per acre respectively. The tenderometer reading change with advancing maturity was slight for peas in the smaller sieve sizes but increased rapidly for larger sizes. Maturity-yield relationships did not agree with results obtained by other workers, but sieve size results did agree.

3758. Rahn, E. M.
The effect of certain cultural and growth regulator treatments on pod-set and yield of lima beans.
Proc. Amer. Soc. hort. Sci., 1955, **66**: 298-307, bibl. 9.

In preliminary screening tests with 14 growth substances, N-m-tolyl phthalamic acid was the most effective in reducing excessive flower- and pod-drop induced by drought. The use of this chemical as a 125 p.p.m. spray at 100 gal. per acre resulted in an average yield increase of 26%. It appeared to be equally effective in dust form. A single irrigation applied at bloom did not significantly increase average yields but appeared to be of value when a hot, dry period coincided with the pod-setting period. Full irrigation, to maintain available soil moisture above 75% field capacity, significantly increased yields by 35%. Cultivation during the bloom period and straw mulching had no significant effects on yield.—Del. agric. Exp. Stat., Newark.

3759. Danielson, C. E.
Starch formation in ripening pea seeds.
Physiol. Plant., 1956, **9**: 212-19, bibl. 11.

Sugar was accumulated in pea seeds (variety Profusion) at a rate maintaining a level of 8–9% of the total amount of water in the seeds. At the end of the ripening process the sugar content decreased rapidly. Starch synthesis proceeded at 2 different rates. For canning, peas should be harvested just before the sugar concentration begins to decrease.—Aktiebolaget Findus, Bjuv, Sweden.

3760. State College of Washington.
Tests with beans 1954.
Ext. Circ. Wash. St. agric. Ext. Serv. **254**, 1955, pp. 5.

The responses of Red Mexican and Pinto beans to N and Zn manuring were studied. Ammonium nitrate increased yields on all 3 soil types. Responses to Zn fertilization were not very marked.

3761. Fraser, W. S.
The influence of magnesium, potassium and lime on the yield and chemical composition of beans.
Diss. Abstr., 1956, **16**: 611-12, being *Publ.* 16231 of 182 pp.

The effects were studied of 1 rate of applied Mg, 2 rates of applied K, and 2 kinds of limestone on yield and composition of beans grown in 16 Nova Scotia soils. In general magnesium sulphate had little effect on dry weight yield; the Mg content of beans was increased by Mg applications on some soils but not when lime was used. Magnesium fertilization hardly affected K or Ca contents of the plants. Potassium applications had little effect on growth, but significantly increased K uptake and decreased Mg and Ca contents of the plants. Both calcitic and dolomitic limestones significantly increased growth and Ca content and markedly reduced Mn content of bean plants. High rates of K application resulted in pale green or chlorotic plants, but plants treated with dolomite were normal at all levels of applied K.—Mich. St. Univ.

3762. Nekljudov, B. M.
The effect of molybdenum on pea yields. [Russian.]
Agrobiologija, 1956, No. 1, pp. 134-7, bibl. 8.

The established optimum rate of 1 kg. Mo per ha. applied as side dressing to 10-day-old pea seedlings increased yields by 4·77 centners per ha. The same rate of Mo applied before sowing with P and K each at 60 kg./ha. gave a yield increase of 1·94 centners and with the further addition of 2 tons of calcareous tufa 3·45 centners per ha. Mo increased the protein content of pea seeds by more than 2% and the vitamin C content of plants by 43%. The microelement also had a favourable effect on N nutrition and photosynthesis.

3763. Shorrock, R. W.
Application of materials to control pests and diseases of pea crops.
J. Sci. Food Agric., 1956, **7**(Suppl.): 37-44, bibl. 13.

Effective control of pea weevil, greenfly, pea moth, thrips and leaf miners is obtained by spraying with DDT emulsion. Midge can be a serious pest locally. Some mechanical damage to the crop when spraying against greenfly and pea moth is inevitable, but ways of minimizing this are indicated. No effective control of downy mildew or powdery mildew has yet been found. Seed treatment with thiram reduces attack from soil-borne fungi. Marsh spot may be prevented by spraying with manganese sulphate at flowering time. Eelworm remains a problem for the future.

3764. Wiltshire, G. H.
The effect of darkening on the susceptibility of plants to infection with viruses. I. Relation to changes in some organic acids in the French bean.
Ann. appl. Biol., 1956, **44**: 233-48, bibl. 16.

The susceptibility of French bean plants to infection by the Rothamsted strain of tobacco necrosis virus as measured by the local-lesion method is increased by a rise in temperature and usually by darkening the plant before inoculation. If part only of a leaf is darkened, that part becomes more susceptible. Plants in full light also become more susceptible if CO_2 is removed from the air, whereas the susceptibility of plants in the dark is not altered. Darkening leaves decreases their content of malic, fumaric, succinic and glycolic acids and increases the content of citric acid; the content of oxalic and malonic acids remains constant. These changes occurred in winter and summer and whether or not darkening increased susceptibility. The effect on susceptibility of individual acids infiltrated into the leaf was measured in leaves kept in the light or in the dark before inoculation. None of the acids used produced any large change in susceptibility. [Author's summary.]—Rothamsted exp. Stat.

3765. Wiltshire, G. H.
The effect of darkening on the susceptibility of plants to infection with viruses. II. Relation to changes in ascorbic acid content of French bean and tobacco.
Ann. appl. Biol., 1956, **44**: 249-55, bibl. 15.

The ascorbic acid content of leaves of French bean and tobacco depends on age of the leaf and on illumination during the period immediately before harvest. There is a measurable diurnal fluctuation with the French bean. Ascorbic acid is lost within a few days from the leaves of intact plants or from detached leaves cultured in water in darkness, and from the darkened part of partly darkened leaves. The simultaneous increase in susceptibility of darkened leaves to infection by viruses was not reversed by infiltrated ascorbic acid. [Author's summary.]—Rothamsted exp. Stat.

3766. Silber, G., and Kainski, J.
Glycerol as an adjuvant in a streptomycin sulfate spray for field control of halo blight of Red Kidney bean.
Fom abstr. in *Phytopathology*, 1956, **46**: 242.

When inoculum levels were high, 0·5% glycerol in a streptomycin sulphate spray did not substitute for higher concentrations of actual toxicant in field usage.

3767. Seay, W. A., and West, S. H.
The effect of seed treatment on yield and germination of garden peas.
Proc. Soil Sci. Soc. Amer., 1956, **20**: 198-200, bibl. 6.

The effects of Spergon treatment and *Rhizobium* inoculation of 5 varieties of garden pea seed on the yield and germination of peas in the field and on germination of peas in soil at 40°, 45° and 50° F. in the laboratory were investigated. Although there was a trend towards increased yield due to either *Rhizobium* or Spergon treatment, and the combination of both treatments gave somewhat better yields than either treatment alone, yield increases were not significant. Spergon treatment increased germination whereas *Rhizobium* inoculation did not affect it. [From authors' abstract.]—Agron. Dep. Univ. Kentucky.

3768. Lubatti, O. F., and Blackith, R. E.
Fumigation of agricultural products. XIV.—Treatment of peas and beans with methyl bromide.
J. Sci. Food Agric., 1956, **7**: 343-8, bibl. 7.

Pea and bean seeds containing as much as 19% water may be successfully fumigated with methyl bromide for insect control. Storage at more than 15% moisture content caused seed deterioration. Seeds surviving damp storage or methyl bromide fumigation yielded as well as untreated seeds. Attempts to relate the results of seed germination in sand to viability as indicated by the tetrazolium test proved difficult.—Imp. Coll. Field Stat., Sunninghill, Berks.

3769. Petrik, C.
Neka zapažanja o rutavoj bubi. **(Some observations on *Tropinota hirta* Poda.)** [English summary ¼ p.]
Zasht. Bilja, 1955, No. 32, pp. 69-71, bibl. 4.

The pollen beetle (*Tropinota hirta*) may also attack young leaves, flower buds and stems of peas and other legumes. Control has been obtained with 0·5% parathion and toxaphene.—Inst. agric. Res., Novi Sad.

3770. Benavides G., M.
Efectividad de varios insecticidas en el control del "lorito verde", *Empoasca fabae* (Harris), del fríjol. **(The effectiveness of various insecticides for the control of *Empoasca fabae* on french beans.)**
Agric. trop. Bogotá, 1955, **11**: 817-24, bibl. 18, illus.

In 2 trials with 11 insecticides the best control was given by 18·5% endrin emulsion and 5% DDT dust. The latter is recommended on account of its less toxic residues.

3771. Torfason, W. E., Nonnecke, I. L., and Strachan, G.
An evaluation of objective methods for determining the maturity of canning peas.
Canad. J. agric. Sci., 1956, **36**: 247-54, bibl. 15.

A series of investigations was conducted during 1951-53 to study objective methods for determining the maturity of canning peas. Both physical and chemical methods were studied, using 3 varieties of pea. Results indicated that all objective measurements of maturity were comparable to texture measured organoleptically. The 3 highest correlations of physical measurement of maturity were for the tenderometer, texturemeter and the pressure tester. Alcohol-insoluble solids and dry matter were the two chemical tests that gave highest correlations. Starch content varied from season to season, and from one variety to another, and thus was not a good indicator of maturity in peas. Dry matter content of peas was found to be correlated with maturity but the determination was not as reliable as that of alcohol-insoluble solids. [From authors' abstract.]—Canada Dep. Agric., Lethbridge, Alberta.

3772. Åvall, H., and Hintze, S.
Skördetidsförsök med konservärter. **(Harvesting trials with canning peas.)** [English and Esperanto summaries ½ p. each.]
Medd. Trädgårdsfors. Malmo **93,** 1955, pp. 19, bibl. 4, illus.

Pod yields were highest at the second and third pickings, but quality declined with each successive picking. Delikatess/54 was of better quality than Alaska or Kelvedon Wonder/54. Time of harvesting was dependent on temperature during the growing season.

Mushrooms.

3773. Stout, G. J. (Block, S. S., and Tsao, G.)
Growing mushrooms on sawdust.
Market Grs' J., 1956, **85**(6): 3, illus.

Promising results have been obtained at the University of Florida with the sawdust culture of the oyster mushroom, *Pleurotus ostreatus*, a species which normally grows on trees. Various kinds of sawdust were tested but the mushrooms appeared soonest on gum-wood sawdust. There was no need to compost the sawdust but it was supplemented with nutrients, moistened thoroughly and sterilized. Yields of 500 lb. per ton of dry sawdust were obtained, and crops were harvested in cycles of 2 weeks from time of inoculation (compared with 2–3 months for the common mushroom). Growth was not affected by light conditions and a temperature of 70–80° F. was suitable. The spawn needs high moisture conditions but lower humidity is required for fruiting. The mushroom is firm enough to be processed by freezing. If commercial methods of production can be developed, the oyster mushroom should prove of special interest in the southern U.S.A. where temperatures are too high for satisfactory production of *Agaricus campestris*.

Onions and allied crops.

(*See also* 3264, 3667-3673, 3855d, v, 3856n, q.)

3774. Perry, B. A., and Jones, H. A.
Performance of short-day pink-root-resistant varieties of onions in southern Texas.
Proc. Amer. Soc. hort. Sci., 1955, **66**: 350-3, bibl. 5, illus.

The varieties Excel, L36, Eclipse, L365 and certain of their F_1 hybrids were found to be highly resistant to pink root (*Pyrenochaeta terrestris*) in southern Texas. L281 appeared to be less resistant but produced satisfactory yields in heavily infested soil. The Grano types were very susceptible, whereas Granex was intermediate in susceptibility.—Winter Garden Substat. Texas agric. Exp. Stat., Crystal City.

3775. Quagliotti, F.
Sui criteri di valutazione dei semi di cipolla in saggi di germinazione. **(On the definition of viability in onion seed.)**
Sement. elett., 1956, **2**(3): 24-34, bibl. 2, illus.

Tests in Italy lead to the conclusion that seeds of the genus *Allium* should be considered viable if they give rise to normal seedlings irrespective of whether these have or have not got root hairs.

3776. Grolleau, J., and Prevost, H.
Compte rendu d'un essai indicatif de dates de semis d'oignons à déshydrater. **(Report on a pilot experiment on sowing dates for dry-storage onions.)**
Terre maroc., 1956, **30**: 205-9.

Five sowing dates at approximately fortnightly intervals were tested for Kirdassi and Mulhouse onions in various districts of Morocco, the first being 1st October. Plants from direct seeding were thinned to the same density as those transplanted. All the Mulhouse plantings failed to form normal bulbs and the last sowing produced stunted, hollow growth. The earliest date was most favourable for transplants and the three following dates for direct seeding of Kirdassi. Trials with sets of Mulhouse of either French or Moroccan origin were completely unsuccessful.

3777. Persson, A. R., and Ratvik, H.
Plantemetoder for kepalauk. Arbeidsstudier. **(Planting methods for onions. Time studies.)**
Gartneryrket, 1956, **46**: 354-5, 357, 361-2, 364, bibl. 2, illus.

Planting with a dibber, 1 plant per hole at a spacing of 5 cm. or 2 plants per hole at 10 cm., proved economically inferior to planting with a pointed hoe, 1–3 plants per hole and with the same number of plants per unit area. In another trial, carried out for one year only, machine planting showed no advantage over hand planting.

3778. Joubert, T. G. La G.
Better onions for the Transvaal. II. Storage and seed production problems.
Fmg S. Afr., 1956, **32**(2): 63-6, bibl. 2, illus.

A method of preventing storage losses in early onions intended for seed production is described. The bulbs are stored for 3 months after harvesting in early November [N.B. Southern hemisphere] and are replanted in early February. They do not develop seed stems but form bunches of bulbs which are lifted about mid-June, stored at 37° F. for 6 weeks and then planted out in early August. A seed crop is produced in December. The varieties most suitable for this treatment are Early Texas Grano and Early Cape Flat. The value of this method in the breeding of new varieties for the Transvaal is indicated. The method can also be used by home gardeners to produce early onions.—Hort. Res. Stat., Pretoria. [For part I see *H.A.*, 26: 2865d.]

3779. Aoba, T.
On bulb formation and dormancy in onion. III. On the process of sprouting in stored onion. IV. The influence of storage temperature on sprouting. [Japanese, with English summaries 11 and 8 lines respectively.]
J. hort. Ass. Japan, 1955, **24**: 199-203, bibl. 15, illus., and 265-70, bibl. 14, illus.

Part III. A morphological study of scale growth in stored onions showed that the true rest period lasted for about a month under ordinary storage conditions, and that sprouting occurred 1–2 months after the beginning of scale growth.

Part IV. High storage temperatures (above 28° C.) broke dormancy in onion bulbs but inhibited growth of inner scales and delayed sprouting. Thus when storage at a high temperature was followed by a period at normal temperatures allowing scale growth, sprouting was accelerated. Low storage temperatures had no effect on dormancy but inhibited growth of inner scales and so delayed sprouting. [For Part II see *H.A.*, 25: 4065c.]

3780. Drinkwater, W. O., and Janes, B. E.
Effects of irrigation and soil moisture on maturity, yield and storage of two onion hybrids.
Proc. Amer. Soc. hort. Sci., 1955, **66**: 267-78, bibl. 14, illus.

In a 2-year trial on fine sandy loam total yields of Asgrow Y-14 and Asgrow Y-42 onion F_1 hybrids were greater in all the irrigated treatments than in the non-irrigated treatment. In the moist 1952 season, however, incidence of defects was high on irrigated plots and irrigation did not affect yield of U.S. No. 1 bulbs. In the dry 1953 season yields of U.S. No. 1 bulbs from the heavy-and-infrequent and light-and-frequent irrigation treatments were higher than yield from the non-irrigated treatment. Yield of U.S. No. 1 bulbs in the heavy-and-infrequent irrigation treatment was higher than yield of this grade from any other treatment.

Non-irrigated onions matured first and onions receiving heavy-and-frequent irrigations matured last. Weight loss in storage was greater in non-irrigated onions than in onions from any of the irrigation treatments. Storage temperature did not influence the effect of irrigation treatment on storage quality.—Storrs agric. Exp. Stat., Conn.

3781. PRIDAN, O. G.
The effect of microelements on the yield of onions in North Transuralia. [Russian.]
Doklady Akad. Nauk S.S.S.R., 1956, **106**: 926-9, bibl. 6, illus.

Treating onion seed with Cu, Mn, Zn, B and Co improved, to a greater or lesser degree, the yield of sets and hastened their maturity. The growth and yield of onions were markedly increased by soaking the sets in a 0·02% solution of $CuSO_4$ or borax and storing them in sawdust at 10–12° C. for 5 days before planting. Copper sulphate at 15 kg. and borax at 5 kg. per ha. applied to the soil with a complete fertilizer gave similar results but at a higher cost. Cu gave somewhat larger yield increases than B in both cases; it improved leaf colour and prevented bolting. Copper and boron treatment of the sets also resulted in increased ascorbic acid and sugar contents of the onion bulbs, B having the greater effect on the former and Cu on the latter.

3782. ISENBERG, F. M.
The effect of height of fall on onion bruising.
Proc. Amer. Soc. hort. Sci., 1955, **66**: 331-3, bibl. 1.

A drop of 4 ft. on to a non-resilient surface was found to be the maximum that an onion bulb can stand without serious damage. This fact should be considered when loading from mechanical harvesters or transferring onions into bulk storage. After a cushion of onions has covered the non-resilient surface there is considerably less danger of excessive bruising.—Cornell Univ., Ithaca, N.Y.

3783. DOEPEL, R. F.
Downy mildew of onions.
J. Agric. W. Aust., 1956, **5**: 185-90, bibl. 1, illus.

In further experiments during the season 1955/6 the value of zineb for controlling downy mildew of onions [see *H.A.*, 26: 656] was confirmed on both field and seed crops. The spray should be applied at 1½ lb. per 100 gal. plus spreader every 10–14 days beginning before mildew develops. J.R.L.

3784. RUCKES, H., JR.
A study of spray deposit on onions.
Diss. Abstr., 1956, **16**: 204, being *Publ.* 15531 of 70 pp.

Mist concentrate, low volume and high volume spray applications were compared by determining the type of deposit and degree of pest and disease control given by each method. Mist concentrate applications deposited more material on the distal area than on the middle and basal areas of the leaves; deposits of low volume applications appeared to be greater on the basal area than on the middle and distal areas, while high volume application produced a more even distribution but a relatively lighter deposit on all areas of the leaves. Deposits produced by concentrate applications appeared to be more easily redistributed by rain down the leaf surface than the other two types of deposit. Low volume deposits appeared to have the greatest tenacity. Data on control of thrips, downy mildew and onion blast showed that all methods gave highly significant pest and disease control. There was an indication of slightly better thrips control with concentrate and high volume applications.—Cornell Univ.

3785. SHERF, A. F., AND STONE, K. W.
Field control of root knot nematode in onion muck by the use of fumigants.
From abstr. in *Phytopathology*, 1956, **46**: 242.

Plots of muck soil heavily infested with root nematodes were fumigated with D-D at 40 gal./acre, Dowfume W-85 (1,2-dibromoethane) at 6 gal./acre, and N-869 (*N*-methyl dithiocarbamate dihydrate) at 25 gal./acre by means of tractor-mounted injection equipment. All treatments gave some yield increase, that with D-D being large. W-85 had a moderate inhibitory effect on onion growth. Observations on carrots, lettuce and radish that were spot planted in the plots indicated successful nematode control with D-D and W-85 and poor control with N-869.

Rhubarb.

3786. FOREST, B.
Acidity of rhubarb petioles as influenced by mineral nutrition and environmental factors.
Diss. Abstr., 1956, **16**: 618, being *Publ.* 15994 of 111 pp.

A reasonably constant relationship was found between titratable acidity and pH of expressed juice from rhubarb petioles. Younger petioles were more acid than older ones, while soluble K content increased as petioles aged. The acid content of petioles was low at the start of the harvesting period but increased during the season. Petioles grown in full sunshine were more acid than those grown in partial shade. In outdoor conditions increasing K in the nutrient solution lowered acidity, whereas increasing NO_3 increased acidity and yield of petioles. In greenhouse conditions there was a gradual increase in fresh weight but a decrease in acidity of petioles resulting from increased amounts of nitrate. Greenhouse studies indicated that petioles grown at a low temperature were more acid and their total sugar content was lower than under high temperatures. The petioles were more acid in the light than in complete darkness. Soil moisture did not influence petiole acidity either in light or darkness.—Cornell Univ.

Root crops.

(*See also* 3316e, 3654-3657, 3737, 3855z, 3856q, s, x.)

3787. MANN, H. H.
Woburn Experimental Station—Artichokes ["topine"].
Rep. Rothamsted exp. Stat. for 1955, p. 180.

A few notes on the second year's results with the Topine strain of Jerusalem artichoke [which appeared somewhat startlingly in the news a year or two ago].

3788. Fisher, J. E.
Studies on the photoperiodic and thermal control of flowering in carrots.
From abstr. in *Plant Physiol.*, 1956, **31** (Suppl.): xxxvi.

Short photoperiods (12 hours) before vernalization induced earlier and more profuse flowering. Long photoperiods (18 hours) after vernalization stimulated flowering. Low light intensity (35 fc) during vernalization inhibited flowering. The region of light sensitivity was apparently the apical meristem. A temperature of 32° C. for 3·5 or 7 days after vernalization reduced the percentage of flowering plants. Flowering was reduced even more if the heat treatment was preceded by 3·5 days at 21° C. immediately after vernalization. —Bot. and Plant Path. Div., Ottawa, Ontario.

3789. Booth, V. H.
Alpha-carotene in leaves of the carrot plant.
J. Sci. Food Agric., 1956, **7**: 386-9, bibl. 12.

About 13% of the carotene in leaves of pigmented carrots was in the α-form. α-Carotene was absent from the leaves of all types of "white"-rooted carrots except second generation albinos, although the content of β-carotene was normal. α-Carotene was present in cotyledons of those carrots which had, or would later have, any carotene (α or β) in their roots, even at a stage too early for the roots yet to be coloured. [Author's summary.]—Dunn Nutrit. Lab., Cambridge.

3790. Janicki, J., and Nowakowski, K.
Produkcja koncentratów karotenowych z marchwi. **(Carotene concentrates from carrots.)**
Przem. Spoż., 1955, No. 7, pp. 283-7, illus., from abstr. in *Polish tech. Abstr.* [in English and Russian], 1956, **2**(22), No. 4182.

Two methods of dehydration of carrots are described and compared. Using the first method, exposure to 40° C. for 110 hours, the loss of carotene amounted to 38·4% and using the second, exposure to 55° C. for 37 hours, to 11·9%. The extraction of carotene by rape oil was investigated and the effect of different methods of disintegration on the yield of carotene extracted from the disintegrated carrots was studied.

3791. Whitney, N. J.
The control of violet root rot in Ontario.
Canad. J. agric. Sci., 1956, **36**: 276-83, bibl. 6, illus.

In greenhouse experiments violet root rot of carrot, caused by *Rhizoctonia crocorum*, was controlled in naturally infested muck soil by the application of a 4% solution of formaldehyde at the rate of 2 l. per sq. yd. or of 20% pentachloronitrobenzene at the rate of 50 g. per sq. yd. In the field the disease was suppressed in decreasing order of effectiveness by methyl bromide (Dowfume MC-2), formaldehyde, bleaching powder and 50% thiram. One application of each of the first 3 materials gave significant disease reduction for 2 years; methyl bromide, however, considerably depressed the stand of carrots. Other control measures recommended include the use of tolerant varieties (Chantenay and Chantenay Red Cored) and early harvesting.—Plant Path. Lab., Canada Dep. Agric., Harrow, Ont.

3792. Kho, Y. O., and Braak, J. P.
Opbrengstvermindering en kiemkrachtverlaging van wortelzaad als gevolg van aantasting door wantsen. **(Reduced yield and viability of carrot seed caused by *Lygus campestris*.)** [English summary 8 lines.]
Meded. Dir. Tuinb., 1956, **19**: 440-5, bibl. 8, illus.

Lygus campestris causes abnormal development of seed umbels in carrots, which results in reduced seed yield and rate of germination. Control methods are briefly mentioned.—Inst. Vered. Tuinbouwgew., Wageningen.

3793. Hoyle, B. J.
Horseradish culture at Tulelake, California.
Veg. Crop Ser., Univ. Calif. **74**, 1955, pp. 7, bibl. 3.

Cultural methods which have proved successful in 2 seasons' trials are described. The best variety tested was the common American type. Planting the roots at an angle of 30° was best. Pruning of side roots during the growing season has proved unnecessary. Yields from good stock have been between 4 and 7 tons per acre.

3794. Hoyle, B. J.
Storing horseradish stecklings.
Calif. Agric., 1956, **10**(6): 6, 14.

Three groups of horseradish cuttings were subjected to different storage treatments. After pit storage from December to March there was little surface mould where soil was sifted among the roots; where straw had lain against the roots a thin layer of mould developed. No decay developed in a pit dug in sandy soil 20 inches deep, with a 4-inch soil layer on top. Decay incidence was greater in cardboard boxes in a cold store than in the pits, but drying up of the cuttings was prevented by using water-proof paper or polyethylene linings. Among the third group, cuttings wrapped in polyethylene or aluminium foil had little decay and the appearance of the cuttings after storage at 38° F. was good. Storage at 78° F. or 0° F. without wrapping was not satisfactory.

3795. Banga, O., and van Bennekom, J. L.
Praktijkproeven met Ronde Witpunt Radijs 1953-1954. **(Variety trials with round white-tipped radish 1953-1954.)** [English summary ½ p.]
Meded. Dir. Tuinb., 1956, **19**: 301-14, illus.

Fifty-two radish selections were evaluated for colour, root shape, uniformity, cultural value under glass and in the open, and resistance to sponginess. All selections except one could be classified into 6 types; 31 of the selections were approved.

3796. Ono, H.
Intracellular conditions which control the interchange of starch and sugar in plants.
Jap. J. Bot., 1955, **15**: 28-48, bibl. 58.

Starch changes were studied in different varieties of radish, particularly Chinese and Japanese varieties. It was shown that early varieties have a short starch-forming period, the starch content reaching a maximum in the early period of growth, whereas in late varieties the reverse is true and midseason varieties are intermediate. In the starch-forming period the contents of free phosphatase, reducing sugars and total acidity and the osmotic value increase, whereas the amylase activity and pH value decrease. In the starch-consuming period the reverse is the case. The contents of starch, free phosphatase and total acidity increase from the upper towards the lower part of the root, and the content of reducing sugars, the amylase activity, pH value and osmotic value decrease. The interchange of starch and sugar is controlled by pH value, low values accelerating the formation of starch. Long-day treatment accelerates the changes in starch content and causes late varieties to behave as midseason ones and midseason varieties to behave as early ones. Physiological changes in the upper part of the root are affected by meteorological conditions, especially low temperatures, whereas those of the lower part of the root are not.—Kyushu Univ., Kurume, Fukuoka-ken.

3797. Dewey, D. H., and Wittwer, S. H.
Chemical control of top growth of pre-packaged radishes.
Proc. Amer. Soc. hort. Sci., 1955, **66**: 322-30, bibl. 6, illus.

Regrowth of tops and roots of topped, prepackaged radishes was inhibited by foliage sprays of maleic hydrazide prior to harvest. Maximum effectiveness was shown by 2,500 or 5,000 p.p.m. sprays applied 24 hours before harvest. Pre-harvest applications of 3-amino 1,2,4-triazole (2,500 p.p.m.) and α-cyano-*β*-(2,4 dichlorophenyl) acrylic acid (2,500 p.p.m.) also gave some inhibition of top and root growth, but neither was so effective as maleic hydrazide.—Mich. St. Coll., E. Lansing.

3798. Sheets, O., and others.
The effects of different levels of moisture on the vitamin, mineral and nitrogen content of turnip greens.
Proc. Amer. Soc. hort. Sci., 1955, **66**: 258-60, bibl. 3.

The P content (dry basis) of turnip greens was consistently increased by irrigation, and in 2 out of 5 samplings in 2 successive years carotene content also showed a significant increase. Ca content was generally reduced by irrigation. Dry matter, ascorbic acid and Fe contents were unaffected in any year and N showed erratic results.—Miss. agric. Exp. Stat., State College.

Salad crops.

(*See also* 3723, 3855m, 4031c.)

3799. Kahn, A., Goss, J. A., and Smith, D. E.
Light and chemical effects on lettuce seed germination.
From abstr. in *Plant Physiol.*, 1956, **31** (Suppl.): xxxvii.

By using several organic and inorganic compounds in concentrations resulting in osmotic pressures up to about 3·5 atmospheres it was shown that at least one type of chemical inhibition of lettuce seed germination was osmotic. Small quantities of red light prevented this inhibition but this effect was reversed by far red light. A mixture of gibberellic acid and gibberellin A also prevented osmotic inhibition of lettuce seed germination.—Univ. Calif., Los Angeles.

3800. Rappaport, L., Wittwer, S. H., and Tukey, H. B.
Seed vernalization and flowering in lettuce *Lactuca sativa.*
Nature, 1956, **178**: 51, bibl. 3.

The effects of seed vernalization of lettuce on seed stalk development were studied in combination with temperature, day-length and growth substance effects, leaf number preceding the visible inflorescence being used as a "physiological index" of flowering. The standard procedure for vernalization consisted of pre-germinating moist seed at 60–70° F. for 24–48 hours and then subjecting it to 40° F. for at least 13 days. Periodical temperature interruption of 60–90° F. for 2 hours daily did not nullify the vernalizing effect of cold exposure, but certain other deviations from the standard procedure resulted in delayed flowering. The addition of 20 and 40 p.p.m. maleic hydrazide to the water used in moistening the seed caused visible flower parts to appear at a lower node than in the controls. Night temperatures above 65° F. subsequent to seed vernalization accelerated seed stalk development without preceding head formation. Below 65° F. plants grown from vernalized seed first produced a high percentage of firm heads and then flowered, whereas non-vernalized plants flowered only at night temperatures above 65° F. The potential for flowering was decidedly greater following seed vernalization, but flowering was afterwards delayed by continuous night temperatures below 65° F. and was completely absent at 50° F. It is suggested that much of the disparity in results obtained with seed vernalization of lettuce by various workers may be resolved on this basis. The effects of soil temperature, photoperiod and a combination of cool temperatures (below 65° F.) with short days on seed stalk development of lettuce plants from vernalized seeds are also discussed.—Mich. State Univ., E. Lansing. [See also *H.A.*, 26: 679.]

3801. Moss, N.
Intensive cultivation section.
A.R. Luddington exp. Hort. Stat. 1955, 1956, pp. 42-51.

Spring sowing of May Princess gave a greater number of larger marketable lettuce about 17 days later than autumn sowing. An interim report on spacing of self-blanching celery shows that the amount of labour needed to produce celery at 7 in. square makes this spacing probably less profitable than the 9 in. square spacing. Nitrogenous top-dressings were most effective at the 7 in. square spacing.

3802. Moss, N., and Garthwaite, J. M.
Glasshouse section.
A.R. Luddington exp. Hort. Stat. 1955, 1956, pp. 52-60.

Lettuce yields and value increased with increasing plant density [see preceding abstract]. Growth of cucumber plants was better, and early and total yields were higher when plants were grown in J.I.P.3 than in orthodox compost. A straw base to the plant bed had slightly detrimental effects on growth and yield of cucumbers. Observations are recorded on a pilot trial on the time and method of propagation by cuttings of November-flowering chrysanthemums.

3803. Dullforce, W. M.
Growth of lettuce seedlings.
Nature, 1956, **177**: 1244-5, bibl. 4.

Growth of Cheshunt 56 lettuce seedlings was analysed during the first 3 to 4 weeks of growth. The net assimilation-rate increased with light intensity and day length but a negative relationship was indicated between temperature and net assimilation-rates. Leaf area ratios were significantly increased at higher temperatures and decreased at higher light intensities. Conditions of high temperature and low light-intensity were accompanied by increased leaf moisture content. Relative growth-rate values ranged from 0·09 to 0·32 g. per g. dry weight per day.—Dep. Hort., Univ. Nottingham.

3804. Brendler, R. A., Zink, F. W., and Crane, R. I.
Labor saving in the thinning of lettuce.
Veg. Crop Ser., Univ. Calif. **76**, 1955, pp. 5.

Two methods of reducing the labour requirement for lettuce thinning are described. A preliminary thinning by machine, to leave an island of plants from which 1 is selected by hand, reduces labour requirements by an average of 24%. The use of pelleted seed reduced the time spent on thinning by 33⅓%. In this case thinning by hoe was nearly always practicable, and only 2% doubles occurred after thinning. [See also *H.A.*, 26: 1791.]

3805. Nelder, J. A., and Moss, N.
The spacing of lettuce in heated glasshouses.
J. hort. Sci., 1956, **31**: 177-87.

In each of the 3 years of the experiment the marketable yield and value of the crop, lettuce variety Cheshunt 5B, increased as the area per plant decreased, the spacing extremes being 30 and 81 sq. in. per plant. Year-to-year variation was less at close than at wide spacings. Estimates of relative profit, based on value less costs, showed that profit increased with plant density. The mean increase in yield caused by the replacement of square spacing by triangular spacing was not significant. —Luddington exp. Hort. Station, Stratford-on-Avon.

3806. Harward, M. E., and others.
Effects of Al, Fe and Mn upon the growth and composition of lettuce.
Proc. Amer. Soc. hort. Sci., 1955, **66**: 261-6, bibl. 12.

In sand culture experiments with Iceberg lettuce toxic levels of Fe and Al affected the uptake and distribution of other ions differentially; since all elements were not affected to the same extent it is concluded that Fe and Al do not interfere with the root absorption mechanism. A high level of Al in solution had a marked effect in reducing the K leaf content. Increases in Al and Fe leaf contents were associated with reductions in Cu content. The higher levels of Al, Fe and Mn in solution significantly reduced yields. Reductions in growth were obtained before appreciable changes in the Al or Fe content of the leaves occurred. The leaf content of Mn was increased and foliar Mn toxicity symptoms appeared before pronounced decreases in growth occurred.—N.C. St. Coll., Raleigh.

3807. Grogan, R. G., Snyder, W. C., and Bardin, R.
Diseases of lettuce.
Circ. Calif. agric. Ext. Serv. **448**, 1955, pp. 28, bibl. 26, illus.

Symptoms are illustrated in colour and described of the following diseases: mosaic, aster yellows, spotted wilt, big vein, sclerotinia rot, downy mildew, powdery mildew, anthracnose, stemphylium leaf spot, tipburn, fertilizer injury and minor diseases. Control measures are recommended when known, but as regards aster yellows, spotted wilt and sclerotinia rot the extreme difficulty of control is emphasized.

3808. Rich, S.
Chemotherapy of lettuce big-vein.
Plant Dis. Reptr, 1956, **40**: 414-16, bibl. 6.

Before transplanting healthy lettuce seedlings in a field infested with big-vein virus the soil in the flats was watered with various chemotherapeutant solutions. The appearance of big-vein was significantly reduced by treatment with NAA at 50 and 100 p.p.m., 2,4,6-trichlorophenoxyacetic acid at 50 p.p.m., calcium chloride at 1,000 p.p.m., IAA at 50 p.p.m. and zinc sulphate at 250 p.p.m. Treatments with CC1182 and captan were not effective. Plants treated with NAA and CC1182 were stunted. Zinc sulphate increased the fresh weight of treated plants at harvest.—Conn. agric. Exp. Stat., New Haven.

3809. Stewart, J. K.
Heat exchange of lettuce in cartons and other containers.
Proc. Amer. Soc. hort. Sci., 1955, **66**: 334-8, bibl. 4.

Lettuces packed in fibreboard cartons, wood slatted half crates or TKV boxes (consisting of wood, high-wet-strength paper and veneer) were held in each of 2 temperature-controlled rooms at 35° and 71° F. respectively. In each of the 3 containers the rate of cooling was found to be significantly faster than the rate of warming. The comparative rates of heat exchange were very similar for the cartons and TKV boxes, whereas lettuces in crates both warmed and cooled at a significantly faster rate than those in the other 2 containers owing to the greater degree of air circulation.—Univ. Ariz., Tucson.

3810. Stout, G. J., and Johnson, W. L.
Where water boils at 32° . . .
Market Grs' J., 1956, **85**(7): 22.

Cooling of leafy vegetables has been successfully obtained by low pressures. Lettuce can be cooled in about 30 min. and pre-packaged leafy vegetables in 15 min. Lettuce packing and shipping costs have been reduced by about 25% by vacuum cooling between field packing and shipping.

Spinach.

(*See also* 3674.)

3811. Smith, P. G., and Zahara, M. B.
New spinach immune to mildew.
Calif. Agric., 1956, **10**(7): 15, illus.

Trials of the spinach variety Califlay in the United States and Holland have shown that it is completely resistant to downy mildew. The new hybrid is derived from Viroflay, has the same yielding ability and is adapted to the same conditions.

3812. Thompson, A. E.
Spinach joins hybrid family.
Amer. Veg. Gr, 1956, **4**(4): 30-1, illus.

The first hybrid spinach, Early Hybrid 7, has now been released. In variety tests it has outyielded standard varieties by 35–100%. It is resistant to blue mould and blight and has an upright growth habit suitable for mechanical harvesting.

3813. McFerran, J.
Plot technique studies with spinach.
Diss. Abstr., 1956, **16**: 194, being *Publ.* 15518 of 65 pp.

A uniformly-treated field of America spinach was used in a study to estimate optimum plot size and shape, and to evaluate the relative efficiency of certain lattice designs. When the coefficients of variability were plotted against plot size in units, the optimum size of plot was 4–6 basic units when constant replication and increasing area was assumed. With constant area and decreasing replication a plot of the coefficients of variability showed the basic plot to be the most efficient in reducing variability. Balanced lattices were only slightly superior to simple and triple lattices. —Cornell Univ.

Tomatoes, capsicums and eggplants.

(*See also* 3244, 3251, 3281, 3283, 3287, 3315g, v, 3676-3680, 3855c, e, g, h, r, t, w, x, 3856j, m, p, r, v, 3897, 4031c, 4048.)

3814. Darby, L. A.
Tomato breeding.
N.A.A.S. Quart. Rev., 1956, No. 31, pp. 1-9, bibl. 27.

The author discusses breeding work on British glasshouse tomatoes. Methods of achieving disease resistance, of producing labour-saving mutants, of making use of heterosis and of the production of seed are discussed.

3815. Hafen, L., and Stevenson, E. C.
Male sterile tomato plants speed hybrid seed production.
Market Grs' J., 1956, **85**(6): 26, illus.

Studies were made to compare the cost of producing hybrid tomato seed using fertile and the mutant male-sterile Garden State variety as the female parents. The male-sterile plants were pollinated twice as quickly, gave a higher percentage of fruit set and yielded many more seeds per fruit. The time spent in pollination for the production of 4,000 hybrid seeds was 12 minutes for the male-sterile plants and 51 minutes for the fertile plants.

3816. Choudhury, B.
Embryo culture technique—I. The growth of immature tomato embryo *in vitro*.
II. "Embryo factors" and immature tomato embryo.
III. Growth of hybrid embryos *(Lycopersicon esculentum × Lycopersicon peruvianum)* in culture medium.
Indian J. Hort., 1955, **12**: 143-51, bibl. 8, illus., 152-4, bibl. 8, illus., 155-6, bibl. 2.

A more balanced seedling was produced from immature tomato embryos on the author's medium (containing glycine, KI, $CaCl_2.2H_2O$, yeast, sucrose and agar) than on the media of White or Tukey. The optimum temperature for embryo growth was 27° C. and the optimum pH 6·5. Coconut milk (at 30–50%) in the medium was shown to be essential for healthy embryo growth. Malt extract and tomato juice in high concentrations stopped embryo germination, without encouraging embryonic growth. A nitrogen atmosphere did not affect growth of excised embryos in the medium. In experiments with embryos from hybrid seeds only heart-shaped embryos from large seeds could be raised on culture media, but the seedlings were sickly and died after transplanting. The addition of 50% coconut milk to the medium before transplanting gave the seedlings a healthy start, and some grew up to be vigorous but unfruitful plants. Backcrossing of *Lycopersicum esculentum* with these F_1 plants resulted in fruits with abortive seeds.—Univ. Melbourne.

3817. Brežnev, D. D.
The role of environment in the formation of individual characters and features in tomatoes. [Russian.]
Doklady vsesojuz. Akad. seljsk. Nauk, 1956, **21**(1): 16-19.

Results of 10 years' work with over 40 varieties and types of tomato are summarized showing that environmental conditions affect the length of the growing period, the morphological characteristics of both plant and fruit, and the composition of the fruit. It is further shown that when the same varieties were grown from seed produced in different areas fruit composition varied greatly and yields were also affected. [For similar work see *H.A.*, 24: 2787 and 25: 2945.]

3818. Snyder, R. J., and Larson, R. E.
Quantitative inheritance of seed size in a cross between *Lycopersicon esculentum* and *L. pimpinellifolium.*
Bull. Pa agric. Exp. Stat. **607**, 1955, pp. 24, bibl. 30.

Seed weight was inherited quantitatively. It is suggested that seed size may be associated with factors controlling earliness rather than with factors controlling yield.

3819. Marh, A. T., and Feljdman, A. L.
Respiration and the oxidising systems of tomatoes. [Russian, with English summary 9 lines.]
Biohimija, 1956, **21**: 33-7, bibl. 16.

In tomato fruits the rate of respiration declined during ripening. This was accompanied by a decline in the degree to which respiration was catalysed by metallic enzymes and a rise in that by flavin enzymes. Polyphenol oxidase activity was responsible for more than 50% of total respiration and was the enzyme most closely connected with the rate of respiration.

3820. Rovira, A. D.
A study of the development of the root surface microflora during the initial stages of plant growth.
J. appl. Bact., 1956, **19**: 72-9, bibl. 9, illus.

Microfloral development showed a rapid selective multiplication on tomato seed during the initial stages of germination and also on the root almost immediately after emergence. Further development of the root surface population after the initial high rate of multiplication was dependent on normal plant development. In roots of young tomato plants both root hairs and root tips were free from organisms. The results support the hypothesis that excretions are primarily responsible for the stimulation of micro-organisms in the rhizospheres of young plants.

3821. LEONARD, E. R.
A first year's observations on the growth of roots and tops of glasshouse tomatoes, with special reference to development of the fruit.
A.R. Cheshunt exp. Res. Stat. 1953, 1954, pp. 62-71, bibl. 7. [Received 1956.]

Growth of glasshouse tomato plants was measured using glass sheets for observations on root growth. The aerial parts showed a relatively steady rate of growth. Root growth after planting out was rapid, but by early May it had slowed down, declining to a low level by the beginning of June; root growth started again in mid-June and continued until the plants were stopped in early August. Setting and development of the first trusses occurred with the initial peak in root development. The lowest level of root growth and subsequent recovery were associated with picking of the lower trusses, and the new level of development was maintained when the main stem and the laterals had been stopped.

3822. WITTWER, S. H., AND TEUBNER, F. G.
Chilled tomato plants produce more early fruit.
Amer. Veg. Gr, 1956, **4**(4): 34-5, bibl. 1, illus.
Cold exposure of tomato seedlings for early fruit production.
Quart. Bull. Mich. agric. Exp. Stat., 1956, **38**: 588-94, bibl. 4, illus.

In experiments with 10 tomato varieties transferring the seedlings from a greenhouse with a night temperature of 65° F. to a cold frame at 45–60° F. for 2–3 weeks following cotyledon expansion increased early yields by 65%. There were no differences in total yields or fruit size. The effects of chilling tomato seedlings are discussed.—Mich. St. Univ.

3823. (CALVERT, A.)
Growth and development of tomato.
A.R. John Innes hort. Instn, 1955, 1956, pp. 24-5.

The effect of temperature on the number of leaves to the first inflorescence appeared to be controlled by the mean temperature in 24 hours, and extended to approximately the ninth day after cotyledon expansion. When the temperature during a 12-hr day was 70° F. and the night temperature was 50° F. the same number of leaves were formed before the first inflorescence as when the day temperature was 50° F. and the night temperature 70° F. Reduction of the night temperature to 50° F. retarded seedling growth. Light conditions appeared to modify the time of initiation of the first inflorescence, more leaves being formed before the first inflorescence at lower light intensity and shorter day length.

3824. BENDIX, S., AND WENT, F. W.
Some effects of temperature and photoperiod on the growth of tomato seedlings.
Bot. Gaz., 1956, **117**: 326-35, bibl. 10.

Tomato seedlings grown at high (30° C.) and low (3°) temperatures in the dark had lower dry weights than the controls at 14° C. Short periods of high or low temperature treatment produced severe growth limitations. Growth was less limited at 30° C. in the light than in the dark. When both high- and low-temperature treatments were given in the dark to the same plants, the order of treatments and the part of the night during which they were given had no effect on growth reduction.—Univ. Calif., Berkeley, and Calif. Inst. Tech., Pasadena.

3825. BONDE, E. K.
Further studies on the effect of various cycles of light and darkness on the growth of tomato and cocklebur plants.
Physiol. Plant., 1956, **9**: 51-9, bibl. 3, illus.

Young tomato plants grew best under cycles of alternating light and dark periods when each period lasted 6 seconds. Growth was also good under 5-minute cycles, but was relatively poor under 1-minute cycles and quite poor under 30-minute and 60-minute cycles. The growth patterns under the various cycles were not changed by the application of sprays of sucrose, IAA or TIBA except for some depression of growth by IAA. Chlorophyll deficiencies appeared in the leaves of tomato plants grown under 5-minute and 15-minute cycles.—Calif. Inst. Technol., Pasadena. [For earlier work see *H.A.*, 26: 1804.]

3826. MEURMAN, O., AND SALOKANGAS, K.
Tomaatin taimien keinovalokokeesta V. 1955. **(Experiments with artificial light on tomato plants in 1955.)** [English summary ½ p.]
Reprinted from *Maatalous ja Koetoim.*, 1956, **10**: 85-92, illus.

January-sown tomato seedlings were grown under 2 different temperatures (22–23° C. and 14° C.) and 2 light sources (mercury lamps and fluorescent tubes) for the first month after sowing. Cropping began earliest and both early and total yields were highest with the plants started under mercury lamps at the higher temperature. All treatments resulted in earlier cropping and higher early yields than the controls (natural daylight at 22–23° C.) but total yields were not significantly increased by illumination at the lower temperature.—Agric. Res. Centre, Piikkiö.

3827. JOHNSON, S. P., AND HALL, W. C.
Further studies on vegetative and fruiting responses of tomatoes to high temperature and light intensity.
Bot. Gaz., 1955, **117**: 100-13, bibl. 23, illus.

Marglobe and Rutgers plants transplanted before a period of high temperature/high light intensity grew and fruited normally only before the occurrence of these unfavourable conditions. Transplanting directly into these conditions resulted in slow growth and no fruiting. In the field Marglobe and Rutgers plants did not respond to sprays of parachlorophenoxyacetic acid (CPA) during the unfavourable light-temperature period, whereas summer-setting varieties and selections cluster-sprayed with CPA nearly doubled their fruit production. Shading of Marglobe and summer-setting varieties increased stem height. Fruit dormancy of the summer-setting variety S-616 was attributed to high light intensity, and could be partially reversed by shading or by CPA-treatment. It was shown that summer dormancy induced in Marglobe by high temperature/high light intensity conditions was not due to lack of available carbohydrates or to inefficient translocation. The effects of these summer conditions on the IAA-oxidase system are discussed.—Texas agric. mech. Coll. System, College Station. [For an earlier report see *H.A.*, 24: 1628.]

3828. VERKERK, K.
Fotosynthese, stofproduktie en -distributie bij de tomatenplant. (**Photosynthesis and the production and distribution of dry matter in the tomato plant.**) [English summary ½ p.]
Landbouwk. Tijdschr., 1956, **68**: 705-10.

The effects of different light intensities and daylengths on growth of tomato plants were studied. Dry weights of the vegetative parts were increased by increases in light intensity, the differences being greater at lower than at higher levels of light intensity. At lower intensities leaves were thinner, leaf area was relatively larger, stem length was less variable and truss initiation was later than in plants grown at higher intensities. In daylength experiments (at 17° or 23° C.) dry weight values increased with length of day up to 14 hours. Growth at 23° C. was less than at 17° C. The effect of light intensity and daylength was most marked in the weight of the fruit truss.—Earhart Plant Res. Lab., Calif. Inst. Technol., Pasadena. [For an account of temperature effects see *H.A.*, 25: 656.]

3829. HARRIS, G. H.
The response of winter-grown greenhouse tomatoes to supplementary light and varying nutrient levels.
From abstr. in *Agric. Inst. Rev.*, 1956, **11**(3): 37.

Tomatoes (var. Vetomold) were grown in a glasshouse during winter in normal daylength (10–12 hr.) with or without supplementary lighting to give an 18-hr. day, different levels of N, P and K being given. The highest yields in normal daylength were obtained with applications of medium N, P and K, and the lowest yields with low N combined with high P and K. In the extended daylength high N combined with medium P and K applications produced the highest yields. Under additional light high N, P and K increased the growth rate of the plants, whereas in the normal daylength low N with high P and K gave the fastest growth rate. The sugar content of fruits increased as N levels were reduced in the longer photoperiod. Ascorbic acid content was highest at high N in the extended daylength, but in normal daylength high N depressed ascorbic acid content unless accompanied by high P and K. The long photoperiod increased N, P and Ca contents of the fruit but had little effect on K content. Extended daylength accelerated the growth rate of vines and hastened fruit maturity by 3 weeks. A daylength of 14 hours was adequate for optimum yield and quality of fruit.—Univ. B.C., Vancouver.

3830. MCCOMBS, C. L.
An anatomical study of the developing tomato fruit following the application of certain chemicals to the ovulary.
Diss. Abstr., 1956, **16**: 640-1, being *Publ.* 15861 of 61 pp.

Cell division was studied in an autumn and a spring crop of tomatoes (variety Globe) grown under glass. Emasculated flowers were treated with several growth substances or were hand pollinated. Considerable cell division occurred after pollination, and treatment with 2,4,5-trichlorophenoxypropionic acid resulted in increased cell division. All of the chemical treatments resulted in larger cell size, but only treatment with para-chlorophenoxyacetic acid, or indolebutyric plus beta-naphthoxyacetic acid resulted in larger fruit size at maturity.—Ohio St. Univ.

3831. MINGES, P. A., AND MORRIS, L. L.
Handling and shipping tomato transplants.
[*Mimeo.*] *Univ. Calif. agric. Ext. Serv.*, 1955, pp. 3, bibl. 3.

Recommendations are given for providing optimum holding conditions for tomato plants between pulling and transplanting. A temperature between 50° and 60° F. is best. Recovery after transplanting may be helped by sugar sprays before pulling.

3832. LAMM, R.
Lokala gödslingsförsök med drivtomat 1952-1954. (**Fertilizer trials with glasshouse tomatoes 1952-1954.**) [English summary ¾ p., Esperanto summary ½ p.]
Medd. Trädgårdsförs. Malmö **94**, 1955, pp. 26, bibl. 28.

Fertilizers combining various N and K levels were applied in commercial holdings to tomatoes (variety Potentate) which also received an annual application of 5 kg. stable manure per sq. m. By the third year increased yields were apparent at the higher N level in 3 out of 4 localities. High K_2O applications had little effect on total yield on soils rich in potash, but on soils low in K_2O early marketable yields were increased. The tendency to blotchy ripening in fruits was reduced at high rates of N and K_2O applications. [For English account see *H.A.*, 26: 732r.]

3833. VOBLIKOVA, T. V.
The effect of phosphoric acid mist on the yield of tomatoes, cucumbers and mangels.
[Russian.]
Doklady Akad. Nauk S.S.S.R., 1956, **107**: 899-901, bibl. 3.

Phosphorus mist produced by burning 0·1 g. of red phosphorus per sq. m. of growing area was applied under a tent to outdoor tomatoes 8 times between seedling emergence and flower bud formation. As a result the treated plants produced 35% higher yields than the controls. When 2 additional mist applications were made during fruiting, further improvement in total yields was only slight but early yields during August increased significantly. Mist applied only at the time of fruiting doubled yields during the first 2 weeks of harvest but increased total yields by only 5% above those of the controls. Phosphorus mist applied 6 times to cucumbers resulted in a 22% yield increase. [See also *H.A.*, 25: 75.]

3834. Rohrbaugh, L. M., and Rice, E. L.
Relation of phosphorus nutrition to the translocation of 2,4-dichlorophenoxyacetic acid in tomato plants.
Plant Physiol., 1956, **31**: 196-9, bibl. 15, illus.

Young P-deficient tomato plants which received P 3 days before application of labelled 2,4-D had significantly greater stem curvatures, lower fresh weight of the tops, and much more radioactive material in the hypocotyls and the roots than plants given P after 2,4-D application. Plants receiving P 8 hours before or at the time of 2,4-D treatment were intermediate in their responses.—Univ. Okla., Norman.

3835. Marks, J. D., and Bernlohr, R.
Phosphate metabolism in ripening fruit.
From abstr. in *Plant Physiol.*, 1956, **31** (Suppl.): xlii.

Mitochondria isolated from ripening tomatoes lost their phosphorylative ability as ripening proceeded. Bruised immature tomato fruit showed a loss of phosphorylative ability that extended into the undamaged portion of the fruit.—Ohio St. Univ., Columbus.

3836. Butters, R. E.
Are sulphates in the clear for tomatoes?
Grower, 1956, **45**: 767-73, illus.

A series of experiments was carried out to determine whether a low pC [specific conductivity] value in the soil due to sulphates has the same effect on growth of tomatoes as a low pC value caused by application of fertilizers containing no sulphates. There was no difference in growth of tomatoes up to the 7–8 leaf stage in soils with low pC values induced by calcium sulphate (in the form of gypsum) or nitro-chalk. After planting out, plants supplied with gypsum to bring the pC to as low as 2·7 showed no deleterious effects, whereas plants supplied with nitro-chalk to bring the pC to a similar level made considerably less vigorous growth. In a third experiment with plants from the pricking out to the seedling stage, increases in salt concentration due to ammonium nitrate caused a reduction in vigour, darker green foliage and some leaf mottle, but the further addition of calcium sulphate had no effect on growth even though pC values were depressed. The best growth was made by plants receiving gypsum alone with no ammonium nitrate.

3837. Anon.
Experiments on the effect of magnesium deficiency on the yield of glasshouse tomatoes.
Ref. Bull. F. W. Berk and Co. Ltd., **3**, London, 1956, pp. 6, bibl. 5.

Pot experiments made in 1944 and 1945 showed that the correction of acute Mg deficiency may increase tomato yields by about 2 lb. fruit per plant. The development of leaf chlorosis was reduced progressively as Mg dosages were increased, but yields did not continue to increase beyond a certain dosage of Mg.

3838. Vlamis, J., Martin, W. E., and Gowans, K. D.
Molybdenum deficiency on residual soil derived from basalt.
From abstr. in *Plant Physiol.*, 1956, **31** (Suppl.): vi.

In a residual soil developed on basaltic lava flows Mo deficiency was induced in greenhouse-grown tomato plants; the symptoms were corrected by a foliar application of molybdic acid.

3839. Hoover, M. M., and others.
Horticultural characters and reaction to two diseases of the *Lycopersicon* accessions in the North Central region.
Res. Bull. Ohio agric. Exp. Stat. **765**, 1955, pp. 19 and tables, bibl. 21.

Twelve hundred and fifty-three accessions were classified for their reaction to tobacco mosaic and the leaf phase of *Alternaria solani*; they were also evaluated for horticultural characters.

3840. Massey, D. M., and Winsor, G. W.
"Blotchy ripening" of tomato fruit: a preliminary report on some chemical aspects of the disorder.
A.R. Cheshunt exp. Res. Stat. 1954, 1956, pp. 50-4, bibl. 15.

Analyses of normal and "blotchy" tomato fruits were made. In normal fruits the content of dry matter and concentrations of soluble solids and reducing sugars were higher than in "blotchy" fruits. The concentration of total solids and the acidity of the sap showed a progressive decrease from the red to the green areas of the fruit wall in "blotchy" fruits.

3841. Costa, A. S.
Superbrotamento de *Erigeron bonariensis*.
(Witches' broom of *Erigeron bonariensis*.)
[English summary 7 lines.]
Bragantia, 1955, **14**: iii-v, bibl. 2, illus.

The virus causing witches' broom of the noxious weed *Erigeron bonariensis* caused a more severe infection of tomatoes than that due to "big bud", but of similar type. New leaves developed chlorotic margins, axillary buds and flower calyces showed hypertrophy and eventually the plants died. Transmission from the weed was effected by grafting, but not by any of the 8 insect vectors tested, although it appears to be vector-transmitted in nature. Dodder (*Cuscuta campestris*) was an effective agent of transmission when transferred to tomato from diseased *Erigeron*.

3842. Williams, P. H., and Ebben, M. H.
Tomato root studies.
A.R. Cheshunt exp. Res. Stat. 1953, 1954, pp. 24-6, bibl. 2. [Received 1956.]

The numbers of bacteria and fungi isolated from glasshouse soils were not appreciably affected by fallowing, but steaming did lead to significant changes. Steaming greatly reduced the occurrence of *Colletotrichum atramentarium* in and on tomato roots, while fallowing produced only a temporary reduction.

3843. Varma, R. P.
Soil conditions and root diseases. X. The tomato wilt Fusaria.
J. Ind. bot. Soc., 1954, 33(1-2): 43-72, from abstr. in *Supl. bibl. Turrialba*, 1955, **5**: 65.

A comparison of the pathogenicity of 38 isolations of *Fusarium* made from Bonny Best tomato showed that *F. lateritium* v. *uncinatum* was the most virulent and *F. solani* v. martii the least. Pathogenicity varied with the period of incubation of the fungus in the soil before the seed was sown. None of the tomato varieties tested showed resistance. The pathogen was not seedborne.

3844. Bazán de Segura, C., and Corrales Macedo, A.
Control del "hielo" del tomate en el valle del Rimac. (**Control of tomato blight in the Rimac valley.**)
Informe Estac. exp. agríc. La Molina **99**, 1956, pp. 13, illus.
Comparativo de fungicidas para el control del *Phytophthora infestans* en el tomate. 1955. (**Comparison of fungicides for control of *Phytophthora infestans* in tomato, 1955.**)
Inf. mens. Estac. exp. agríc. La Molina, 1956, 30(342): 1-10, illus.

Late sown "Indiana Baltimore" tomatoes were sprayed at approximately weekly intervals beginning 15 weeks after sowing, to compare the action of 3 : 4 : 100 bordeaux mixture, two zinc ethylene bisdithiocarbamates (Parzate and Dithane Z-78) and a manganese ethylene bisdithiocarbamate (Manzate). The carbamates were applied as 0·25% aqueous solutions and all applications were at 700 l./ha. Highly significant control of *Phytophthora infestans* was achieved with all 4 fungicides, each of the carbamates being significantly superior to bordeaux with regard to both control and yield. Vegetative growth was retarded by bordeaux mixture.

3845. Sidorovina, E. P., and Kovaljkov, F. V.
Tomato russet mite and its control. [Russian.]
Sad i Ogorod, 1956, No. 7, p. 31.

Of acaricides tested against russet mite, *Vasates lycopersici*, attacking greenhouse tomatoes, 0·2% thiophos was the best, having very good killing and residual actions. Satisfactory control was also obtained with ISO which can be applied with safety during fruiting.

3846. Wene, G. P.
Control of serpentine leaf miner infestations on seedling tomatoes and cantaloupes.
J. Rio Grande Valley hort. Soc., 1956, **10**: 67-9.

The author concludes that the control of the serpentine leaf miner, *Liriomyza subpusilla*, on seedling tomatoes and cantaloupes is of little value because young, rapidly growing leaves are only slightly infested even when attack on the cotyledons has been severe. Later attacks on mature leaves can be controlled with parathion. J.R.L.

3847. Parr, W. J., Crocker, C., and Speyer, E. R.
A sciarid fly injurious to seedlings.
A.R. Cheshunt exp. Res. Stat. 1953, 1954, pp. 36-9. [Received 1956.]

Root hairs of young tomato and *Nicotiana* seedlings were attacked by larvae of *Sciara modesta*. Most of the larvae were controlled by soil applications of parathion at 20 p.p.m., which did not injure the seedlings.

3848. Perraudin, G.
Une expérience de conservation de la tomate en 1955. (**A tomato storage trial in 1955.**)
Rev. romande Agric. Vitic., 1956, **12**, 50-2.

Tomatoes variety Gloire de Rhin, picked when fully ripe, were stored for 24 days at a constant temperature of +4° C. and r.h. 92%. After storage the weight loss did not exceed 2%; the number of diseased fruits was less than 4%. Storage at +2° C. gave similar but less satisfactory results. Unripe fruits were not suitable for storage under these conditions.

3849. Anon.
Heartbreak hormone on the tomatoes.
Grower, 1956, **46**: 404-7, illus.

Tomato plants exposed in their early stages of growth to hormone spray actually applied as a herbicide on adjacent corn lands [and presumably carried across by the wind] have shown abnormal growth and distorted fruits. This has often occurred on a large scale and resulted in almost total loss of crop and is an urgent problem.

3850. MacGillivray, J. H., Hall, B., and Holland, A. H.
Further studies on harvesting of chili peppers.
Veg. Crop Ser. Univ. Calif., **73**, 1955, pp. 6, bibl. 1, illus.

Studies on factors affecting picking efficiency were made for the first pepper harvest. The shortest picking time per ton (7·7 hours) was achieved with cloth sacks held by hooks on the pickers' belts. Pea hampers and wire baskets were emptied most efficiently. In some cases the differences in rate of picking between the most and least efficient workers was almost 100%. [For earlier work, see *H.A.*, 25: 2992w.]

3851. Klindić, O.
Korjenova nematoda (*Heterodera marioni* Cornu) i problem propadanja paprike područja Trebižata. (**Root-knot nematode and the problem of pepper-wilting in the Trebižat region.**) [English summary ¼ p.]
Zasht. Bilja, 1955, No. 32, pp. 31-42, bibl. 7, illus.

Wilting of red pepper plants was found to be caused by an infestation of root-knot nematode. Satisfactory control of the nematode was obtained by DD fumigation in a season's trials.—Inst. agric. Res., Sarajevo.

3852. Choudhri, R. S., and Garg, O. K.
Effect of "little leaf" disease on the growth and physiology of brinjal (*Solanum melongena* L.).
Indian J. Hort., 1956, **12**: 180-7, bibl. 14, illus.

In eggplants affected by "little leaf" leaf chlorophyll content and total carbohydrate percentage were decreased, and total nitrogen percentage was increased. The effects are comparable to those found in virus-infected plants.—Banaras Hindu Univ., Banaras.

3853. Banerjee, S. N., and Basu, A. N.
Experiments on the control of the brinjal mealy bug, *Centrococcus insolitus* (Green) in West Bengal.
Proc. zool. Soc. Calcutta,* 1956, **9**: 45-52, bibl. 5, illus.

This pest of eggplants does most damage in the rainy season. DDT, dieldrin and endrin were ineffective against the mealy bug and kerosene oil emulsion, which was relatively more effective, burned the foliage. In the field 0·1% Basudin gave 68·9% control and in laboratory tests 0·2% was slightly better. More than one application was needed to give adequate control.—W. Bengal St. agric. Res. Inst., Calcutta. J.R.L.

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* Previously *Proc. zool. Soc. Bengal.*

Sundry.

(*See also* 3855k.)

3854. Barrau, J.
Xanthosoma brasiliense: a useful green vegetable.
SPC quart. Bull., 1956, **6**(1): 26, from abstr. in *Trop. Abstr.*, 1956, **11**, no. d1113.

The leaves and stalks of this plant are eaten in Tahiti and Hawaii. It is considered worthy of introduction into other Pacific Islands.

Noted.

3855.

a Akers, T. J., and Fang, S. C.
Studies in plant metabolism. VI. Effect of 2,4-D on the metabolism of aspartic acid and glutamic acid in the bean plant.
Plant Physiol., 1956, **31**: 34-7, bibl. 9, illus.

b Andersen, A. L.
Dry bean production in the Eastern States.
Fmrs' Bull. U.S. Dep. Agric. **2083,** 1955, pp. 29, illus.
Varieties, cultivation, diseases and pests.

c Anon.
Mejores cosechas de pimentón en la época de lluvias. (**Better yields of capsicum in the rainy season.**)
Not. agric. Serv. Shell Agric. Venezuela, 1955, **1**(4): 3-4, illus.
Control of *Phytophthora capsici* with Dithane Z-78 and Perenox.

d Anon.
Medios de combatir al piojito o "trips" de la cebolla. (**Control measures against onion thrips.**)
Not. agric. Serv. Shell Agric. Venezuela, 1955, **1**(7): 3-4, illus.
With dieldrex or BHC sprays and dieldrin or BHC dusts.

e Battaglini, M.
Il peperone "Giallo quadrato d'Asti" in Umbria: biologia e coltivazione. (**The pepper variety Giallo quadrato d'Asti in Umbria: its biology and culture.**)
Ann. Fac. Agrar. Perugia, 1954, **10**: 133-51, bibl. 31, illus.
Capsicum annuum var. *grossum.*

f Brewer, D.
A study of vegetable production and marketing in eastern Oklahoma.
Bull. Okla. agric. Exp. Stat. **B-471**, 1956, pp. 22.

g Cantrill, K. O.
Successful marketing of tomatoes.
Agric. Gaz. N.S.W., 1956, **67**: 189-93, illus.
Recommendations for picking, grading, sizing and packing.

h Cholnoky, L., and others.
Karotinoidok képződése és egymásba való átalakulása paprikatermések érésénél. (**Formation and conversion of carotenoids in paprika fruits during ripening.**)
Vegyip. Kut. Int. Közl., 1954, **4**: 255-62, from abstr. in *Hung. agric. Rev.*, 1955, **4**(1): 11-12.

i Crang, A., and Sturdy, M.
A comparison of some varieties of vegetables preserved by canning and by freezing: progress report IV.
A.R. Long Ashton agric. hort. Res. Stat. for 1955, 1956, pp. 178-81, bibl. 2.
Broad, dwarf and runner beans and peas. Freezing proved superior both as regards colour and flavour. [For earlier report, see *H.A.*, 26: 597.]

j Cutler, H. C., and Whitaker, T. W.
***Cucurbita mixta,* Pang., its classification and relationships.**
Bull. Torrey bot. Club, 1956, **83**: 253-60, bibl. 8.
A description of the least known of the 4 squash and pumpkin species commonly grown in the U.S.A.

k Hodge, W. H.
Chinese water chestnut or matai—a paddy crop of China.
Econ. Bot., 1956, **10**: 49-65, bibl. 14, illus.
Culture in China of *Eleocharis dulcis.*

l Hoffman, J. C., and Kanapaux, M. S.
Relation of visual color rating to chlorophyll contents of snap bean pods.
Proc. Amer. Soc. hort. Sci., 1955, **66**: 339-44, bibl. 12.

m van Hoof, H. A.
Het vuur bij andijvie (*Marssonina panattoniana*). (***Marssonina panattoniana* on endive.**) [English summary ¼ p.]
Meded. Dir. Tuinb., 1956, **19**: 431-6, bibl. 13, illus.
See *H.A.*, 26: 2829.

n Hubbeling, N.
Colour plates of bean defects.
[*Publ.*] *FATIS*, received 1956, 32 colour plates and text.
An English edition of *H.A.*, 25: 2872.

o Irvine, F. R.
The edible cultivated and semi-cultivated leaves of West Africa.
Maveg., 1956, **2**: 35-42, bibl. 20.
Plants supplying salads, vegetables, herbs, beverages, etc.

p Keener, P. D.
Virus diseases of plants in Arizona. II. Field and experimental observations on curly-top affecting vegetable crops.
Bull. Ariz. agric. Exp. Stat. **271**, 1956, pp. 28, bibl. 22, illus.
Symptoms, transmission and suggestions for lessening the severity of the attack.

q KHAN, A. W., AND CHUGHTAI, I. D.
Studies in the ascorbic acid content of common vegetables.
From abstr. in *Proc. 6th Pakistan Sci. Conf., Karachi, 1954, Part III*, p. 181.
Determined in 50 vegetables before and after cooking.

r KING, K.
Blossom end rot in tomatoes.
Qd agric. J., 1956, **82**: 147-51, illus.
Cultural measures to reduce occurrence.

s KNOTT, J. E.
Varieties with resistance to diseases or insects.
Veg. Crop Ser. Univ. Calif. **80**, 1955, pp. 8.
Vegetable varieties and their type of resistance listed.

t VAN KOOT, Y.
De teelt van tomaten in de U.S.A. **(Tomato growing in the U.S.A.)** [English summary 2 pp.]
Publ. Proefst. Groent. Fruit. Glas Naaldwijk **56**, 1956, pp. 93, illus.

u LAUMONT, —., AND CHEVASSUS, —.
Variétés et semences sélectionnées de légumes secs. **(Varieties and selected seeds of dried legumes.)**
Reprinted from *Bull. Renseign. agric.*, 1955, No. 23, pp. 17, illus.
Including broad beans, dried peas and haricots for Algerian conditions.

v LORENZ, O. A., BISHOP, J. C., AND WRIGHT, D. N.
A comparison of the fertilizer value of gaseous, liquid and solid forms of ammonia-containing nitrogen compounds.
Veg. Crop Ser. Univ. Calif. **78**, 1955, pp. 20, bibl. 4, illus.
For onions, see *H.A.*, 26: 652.

w MABROUK, A. F., HUSSEIN, A. A., AND AREF, H.
A rapid method for the determination of total solids in tomatoes.
J. Sci. Food Agric., 1956, **7**: 257-61, bibl. 3.

x MCCOLLUM, J. P., AND LINN, M. B.
Bleaching and disinfecting discolored pepper seed with sodium hypochlorite.
Proc. Amer. Soc. hort. Sci., 1955, **66**: 345-9, bibl. 5, illus.
A more scientific account of the work reported in *H.A.*, 26: 728.

y MACGILLIVRAY, J. H., MINGES, P. A., AND LITTLE, T. M.
Vegetable producers can save—with work simplification methods.
Leafl. Calif. agric. Exp. Stat. Ext. Serv. **57**, 1956, pp. 15.
Application of time and motion study with some examples.

z MCLEAN, D. M., AND CAMPBELL, L.
Diseases of table beet seed plants in Western Washington.
Stats Circ. Wash. agric. Exp. Stats **259**, 1955, pp. 12, illus.

3856.

a MINISTRY OF AGRICULTURE, LONDON.
Stem and bulb eelworm on vegetables.
Adv. Leafl. Minist. Agric. Lond. **440**, 1955, pp. 6, illus.
Symptoms and control of *Ditylenchus dipsaci*.

b MORRISON, K.
Growing field beans in Central Washington irrigated areas.
Ext. Bull. St. Coll. Wash. Ext. Serv. **497**, 1955, 1 folded sheet.
Mainly Red Mexican and Pinto.

c NATIONAL INSTITUTE OF AGRICULTURAL BOTANY.
36th Annual Report of the N.I.A.B., 1955, Cambridge, pp. 54.
Brief notes are given on vegetable trials run in co-operation with the N.A.A.S.

d PAPASOLOMONTOS, A.
Cauliflower seed production in Cyprus.
Countryman, Nicosia, May 1956, pp. 8-9, illus.
The varieties and sowing dates recommended for curd production in Cyprus are noted.

e PATRON, A., SWINZOW, H., AND MICHEL, F.
Études technologiques sur les pois en conserve au Maroc. **(Technological studies on canning peas in Morocco.)**
Fruits et Prim., 1956, **26**: 156-65, bibl. 5.
The variety Rois des Conserves gave the best results.

f PETRONICI, C.
Contributo alla conoscenza del metabolismo azotato nelle piante: variazioni degli aminoacidi liberi e totali nella fava (*Vicia faba major*) durante il ciclo vegetativo. **(The nitrogen metabolism of plants: variations in free and total aminoacids in broad bean during the growth cycle.)** [English summary ½ p.]
Ann. Sper. agrar., 1956, **10**: 841-55, bibl. 23.
In the plant excluding the root, the pod and the seed.

g PEW, W. D., MARLATT, R. B., AND HOPKINS, L.
Growing cantaloupes in Arizona.
Bull. Ariz. agric. Exp. Stat. **275**, 1956, pp. 24, illus.

h POLLARD, D. G.
The insect pests of vegetables in the Sudan.
Bull. Minist. Agric. Sudan **16**, 1955, pp. 72, illus., price 40 P.T. or 8s.
Life history, damage and control.

i POTAPOV, N. G., AND MARÓTI, M.
Nukleinfoszforsav szintézise a bab csíranövény gyökerében és hajtásában. **(Synthesis of nucleic acid phosphorus in the root and shoot of bean seedlings.)** [English, Russian and German summaries 1¼ pp. each.]
Agrokém. Buda., 1956, **5**: 57-68, bibl. 43, illus.

j del Prado, F. A.
Ziekten van de tomaat in Suriname. **(Tomato diseases in Suriname.)** [English summary ½ p.]
Surinaam. Landb., 1956, **4**: 52-66, illus.
Symptoms and control.

k Proctor, J. M.
Putting the fertilizer in the right place.
Fm Mech., 1956, **8**(83): 97-9, illus.
With special reference to pea seed drills with fertilizer placement attachments.

l Reed, L. R.
Field experiences in 1955 with defoliating chemicals as an aid to harvesting dry edible beans.
Proc. 12th annu. Mtg N. centr. Weed Control Conf., 1955, pp. 32-5.
Proc. 10th annu. Mtg N.E. Weed Control Conf., 1956, pp. 286-96.
Using sodium and magnesium chlorates.—From *Weed Abstr.*, **5**, Nos. 518 and 916.

m Roux, A.
Vergleichende Untersuchungen an den Blüten von Tomaten, Puffbohnen und Gemüseerbsen (Pal- und Mark-) zum Zwecke der Verwendbarkeit als Unterscheidungsmerkmal. **(Comparative studies on flowers on tomatoes, broad beans and garden peas to determine differential [varietal] characteristics.)**
Saatgut-Wirtsch., 1956, **8**: 134-7, bibl. 1, illus.

n Scott, F. M., and others.
Electron microscope studies of cell wall growth in the onion root.
Amer. J. Bot., 1956, **43**: 313-24, bibl. 11, illus.
See also *H.A.*, 26: 733b.

o Shell Company of Venezuela.
Recommendaciones para los cultivos de verano. **(Recommendations for summer crops.)**
Inf. Serv. Shell Agric. Venezuela, Ser. A, **4**, 1956, pp. 24, illus.
Preparation of seedbeds and control of weeds, pests and diseases in vegetables and tobacco in Venezuela.

p Smith, H.
A useful contrivance.
Gdnrs' Chron., 1956, **140**: 44, illus.
A frame on 6 in. high legs and covered with wire netting to support the bush tomato "Amateur".

q Statens Forsøgsvirksomhed i Plantekultur.
Løgfluen. **(Onion fly.)**
Gulerødsfluen (*Psila rosae* F.). **(Carrot fly.)**
Medd. Forsøgsvirks. Plantekult. **526** and **532**, 1955, both 4 pp.
Results of Danish trials on control.

r Statens Forsøgsvirksomhed i Plantekultur.
Magnesiummangel. I. Forsøg og undersøgelser med tomat, selleri og kartoffel m.m. 1948–1953. **(Magnesium deficiency. I. Experiments and investigations with tomato, celery and potato in 1948–53.)**
Medd. Forsøgsvirks. Plantekult. **541**, 1955, pp. 4, illus.
Including yield increases following $MgSO_4$ sprays.

s de Vaus, N. K.
Carrot growing in the Dandenongs.
J. Agric. Vict., 1956, **54**: 155-8, illus.
The culture of carrots grown in the hills to the east of Melbourne is described.

t Welch, J. E., and Smith, P. G.
Varieties in use for commercial production in the United States.
Veg. Crop Ser. Univ. Calif. **81**, 1955, pp. 11.
Lists of vegetable varieties recommended for the various states or groups of states.

u Wilkinson, J.
Some aspects of phosphate nutrition in the root system of broad bean (*Vicia faba*).
J. exp. Bot., 1956, **7**: 290-5, bibl. 12.

v Williams, P. H., and Hack, J.
Didymella stem rot.
A.R. Cheshunt exp. Res. Stat. 1954, 1956, pp. 24-5, bibl. 3.
Soil treated with formaldehyde was much less susceptible to reinoculation with *Didymella lycopersici* than steamed soil.

w Wilson, J. D., and others.
Two foreign cucumbers resistant to bacterial wilt and powdery mildew.
Plant Dis. Reptr, 1956, **40**: 437-8.
Introductions from Burma.

x Wright, D. W.
A survey of soil pests affecting vegetable crops.
J. Sci. Food Agric., 1956, **7** (Suppl.): 9-12, bibl. 6.
Control of cabbage root fly, carrot fly and cabbage stem weevil.

y Xinaris, A.
The cultivation of melons in the Zodhia area [Cyprus].
Countryman, Nicosia, April 1956, pp. 16-17.

z Yamaguchi, M., and MacGillivray, J. H.
Nutritive values of California grown green and white asparagus.
Veg. Crop Ser. Univ. Calif. **77**, 1955, pp. 3, bibl. 2.
Results are tabulated.

TOBACCO.

General.

(*See also* 3298, 3681, 3892a-c, f, i, j, m, o, p,)

3857. Haslam, R. J., and Scott, W. A.
Tobacco.
Progr. Rep. Harrow exp. Fm, Ont., 1947–1954, 1956, pp. 11-20, illus.

Breeding and testing tobacco varieties: Flue-cured, burley and dark tobaccos are included, stress being laid on resistance to black root rot (*Thielaviopsis basicola*) and to the brown root complex. Tobacco may be stunted by the latter when it follows maize, soya beans or timothy sod. Six new registered burley varieties are described. *Cultural practices for burley tobacco:* Trials have shown that closer spacing (about 18 in. compared with the usual 24 in. in the rows) combined with higher topping will result in higher yields and better quality, thinner leaves. In fertilizer trials applications made in bands on either side of the row gave better results than drilling in the rows or than broadcasting. In general split applications, half at planting and half 2 to 3 weeks later proved better than application of the whole dressing at planting. A 5–10–5 fertilizer at 1,000 lb./acre has given excellent results on a light soil when used in conjunction with 10 tons F.Y.M. in an alfalfa-burley tobacco-maize-oats rotation. *Curing burley tobacco:* In trials to prevent excessive dampness during air-curing a dehydrator using calcium chloride has given good results on a small scale. New experimental barns have been constructed to test this method and also the liquified petroleum gas (propane) method on a commercial scale. *Maturity studies and harvesting:* For burley tobacco priming has been shown to result not only in better quality but also in appreciably higher yields. Better quality has also resulted from suspending each plant as soon as it is cut, butt uppermost, on a lath stuck in the ground and leaving it to wilt in the field.

3858. Saboor, M. A.
Upgrading of certain naturally occurring leaves in Pakistan for Bidi industry.
From abstr. in *Proc. 6th Pakistan Sci. Conf., Karachi, 1954, Part III*, pp. 184-5.

Results of small-scale experiments at the C.S.I.R. Laboratories, Karachi, show that *Kumbhi* (*Carea arborea*) leaves, subjected to simple physical and chemical processes, can make suitable wrappers for native cigarettes.

Breeding and varieties.

(*See also* 3892h, k.)

3859. Ortiz Ramirez, G.
Comportamiento de un grupo de variedades de tabaco rubio. (**Behaviour of a group of yellow tobacco varieties.**)
Agric. trop. Bogotá, 1956, **12**: 321-5, illus.

The possibilities of introducing yellow tobacco into Santander province, Colombia, were evaluated by tests on 13 Virginia and 8 burley varieties. The most promising were Warner, Bottom Special, Gold Dollar and Dixie Bright 101 among the former and the burley varieties 11-A and 1-1951. Dixie Bright 101 showed the highest degree of resistance to mosaic disease.—Estac. exp. Tabac. El Cucharo, San Gil, Santander.

3860. Endemann, W.
Zur Sortenfrage beim Tabak. (**On the problem of tobacco varieties.**) [English and Russian summaries ½ p. each.]
Ber. Inst. Tabakforsch. Dresden, 1956, **3**(1): 19-41, bibl. 10.

The results are reported of trials with cigarette and cigar tobacco varieties and strains during the period 1951 to 1954. Among 8 cigarette tobaccos tested in 15 experiments B55 has shown better growth, quality and disease-resistance than the standard Virginia Gold A and has been released for commercial cultivation under the name Wohlsdorfer Burley. D23, a low-nicotine strain, has also shown promise. Among 8 cigar tobaccos the two best to date are Havana 2c and Geudertheimer III, but there are 3 others still under trial.

3861. Madamba, U. V., and Malimban, S. B.
Results of a two-year variety test of wrapper tobacco at the Kidapawan Wrapper Tobacco Experiment Station (1950-1952 seasons).
Philipp. J. Agric., 1954 (issued 1955), **19**: 31-9, 42-4, bibl. 2.

In trials on 5 varieties the best results, both in terms of total yield and percentage of wrapper leaves, were given by the Indonesian variety Baker Sumatra followed by the American variety R.G.

Nutrition.

3862. Attygalle, A. B., and Jayanetti, E.
Improvement of the quality of flue-cured cigarette tobacco in Jaffna Peninsula.
Kandiah, S., and Rodrigo, D. M.
The effect of manuring on the burning quality.
Trop. Agriculturist, 1955, **111**: 194-8, bibl. 4, and 199-203, bibl. 9.

Both papers discuss the same 3 fertilizer trials. It is concluded that quality would be improved by reducing the N content of the leaf and burning value by reducing the N, Ca and Mg contents and increasing the K content.

3863. Bolton, A.
Experiments on tobacco-seed production. II. The relationship between rate of applied nutrients, chemical composition of leaf and seed yield.
Emp. J. exp. Agric., 1956, **24**: 161-6, bibl. 14.

Cured leaf of reaped and unreaped tobacco seed plants supplied with varying rates of nutrients was analysed for content of N, P, K, Ca and Mg. The results indicate that: (1) Reaping of leaf reduced the nutrient content of leaf from the top of the plant. This was associated with reduction in seed yield. (2) Increasing the rate of application of P from 100 to 200 lb. P_2O_5 per acre increased the content of this nutrient in the leaf. The best rate for seed production may be between these levels. (3) Increasing the rate of application of K from 100 to 200 lb. K_2O per acre increased the content of K in the earlier reapings. Luxury consumption may have been taking place at the higher rate. (4) Application of Mg had no significant effect on the content of any nutrient in the leaf. [Author's summary.]—Tob. Res. Board S. Rhodesia. [For Part I, see *H.A.*, 26: 1858.]

3864. Pearse, H. L., and Stein, L. H.
Fertiliser studies with tobacco plants using radiophosphorus-labelled superphosphate. Part V.
Reprinted from *J. S. Afr. chem. Inst.*, 1955, **8**: 59-67, bibl. 5.

Labelled superphosphate was applied by 3 placement methods to a soil deficient in available phosphate. In all cases addition of P_2O_5 resulted in increased P_2O_5 uptake, but the method of placement was only important in the early stages of growth. Fertilized plants absorbed more soil phosphate at a late growth stage than did unfertilized plants. Fixation of applied phosphate did not appear to be greater on late-ploughed than on early-ploughed virgin soil. [From authors' summary.]—Centr. Tobacco Res. Stat., Rustenburg, and Nat. chem. Res. Lab., Pretoria.

3865. Schmid, K.
Vegetationsversuch über die Wirkung der Phosphorsäuredüngung auf Ertrag und Qualität von Virginiabak. (**Growth studies on the effect of phosphate manuring on yield and quality of Virginia tobacco.**)
Dtsch. Tabakb., 1956, **36**: 66, from abstract card *Inst. Tabakforsch., Dresden*, No. 56/234.

Different levels and different forms of P were applied in pot experiments to 4 soil types. In every case an application equivalent to 200 kg./ha. of P_2O_5 resulted in higher yields and improved leaf colour.

3866. Weidemann, C.
Beitrag zur Verbesserung der Glimmfähigkeit des Tabaks durch Kalidüngung. (**A contribution to the improvement of the burning capacity of tobacco by potassium manuring.**) [English and Russian summaries ½ p. each.]
Ber. Inst. Tabakforsch. Dresden, 1956, **3**(1): 42-59, bibl. 11.

A 4-year experiment on the manuring of tobacco was carried out on 2 soils with potassium contents of 15 mg. and 12 mg. per 100 g. dry weight. Applications of 200 and 400 kg. K_2O/ha. raised the K content of the soils and improved the burning quality of the tobacco proportionately. On a soil containing 0·56% CaO the addition of Ca had no effect on quality.

3867. Thomson, R., and Askew, H. O.
A leaf breakdown of tobacco associated with the copper status of the soil.
N.Z. J. Sci. Tech., Sect. A, 1956, **37**: 584-99, bibl. 4, illus.

A breakdown of tobacco leaves as they approach maturity was satisfactorily corrected by application of 50 lb. copper sulphate per acre. Affected leaves were rich in total and protein N and after flue-curing were low in sugars. They were also high in Mn and low in Cu, and it is considered that the Mn/Cu ratio should be less than 28.—Tob. Res. Stat., Motueka and Cawthron Inst., Nelson.

Physiology and biochemistry.

(*See also* 3891.)

3868. Vlitos, A. J., Meudt, W., and Beimler, R.
The role of auxin in plant flowering. IV. A new unidentified naturally occurring indole hormone in normal and gamma irradiated Maryland Mammoth tobacco.
Contr. Boyce Thompson Inst., 1956, **18**: 283-93, bibl. 9, illus.

Short-day tobacco flowered under long photoperiods when exposed to gamma rays at dosages of 50, 150, 165, 300 and 430 roentgens per day for 60 days. Flowering occurred irrespective of day length in over 75% of the progeny from irradiated parents. When the offspring of parents which had been treated with 150 r. per day for 60 days were photoinduced by successive short-day cycles, they flowered sooner than normal Maryland Mammoth tobacco. A study was made of the relationship of the naturally occurring indole compounds to the induction of flowering in gamma-irradiated plants. 3-Indole-acetic acid was not detected in leaves, stems, roots or apices of normal plants, or of gamma-irradiated plants or their offspring. An unidentified indole component was found to be the predominant auxin in Maryland Mammoth tobacco. [See also *H.A.*, 24: 3382 and 26: 768 and 2889.]

3869. Giovannozzi, M.
Rapporto generale sulla biochimica del tabacco. (**General report on the biochemistry of tobacco.**)
Tabacco, 1956, **60**: 3-70, bibl. 152.

A detailed review of the biochemistry of tobacco during growth, curing and fermentation, presented to the 1st International Scientific Tobacco Congress held in Paris in September, 1955.

3870. Cuzin, J., and Fardy, A.
Méthode de classement en nicotine des tabacs sur le champ par chromatographie. (**Method of classifying tobacco according to nicotine content by chromatography in the field.**)
Ann. Inst. exp. Tabac, 1955, **2**(2): 39, from abstract card *Inst. Tabakforsch., Dresden*, No. 56/262.

A description is given of a field technique which makes it possible to carry out more than 100 tests a day. The amount of nicotine present is estimated from the relative intensity of the colour produced.

3871. Dewey, L. J., Byerrum, R. U., and Ball, C. D.
The biosynthesis of the pyrrolidine ring of nicotine.
Biochim. biophys. Acta, 1955, **18**: 141-2, bibl. 6.

From the results of experiments, in which ornithine labelled with C^{14} was administered to tobacco plants (*N. rustica*) growing in a nutrient solution, it is concluded that ornithine serves as a specific precursor of the pyrrolidine ring of nicotine.—Kedzie chem. Lab., Mich. St. Coll., East Lansing.

3872. Dawson, R. F., and others.
Biosynthesis of the pyridine ring of nicotine.
J. Amer. chem. Soc., 1956, **78**: 2645-6, bibl. 11.

When either ring-labelled H^3-nicotinic acid or nicotinic acid containing C^{14} in both ring and carboxyl positions was supplied to sterile cultures of excised tobacco roots, substantial amounts of radioactivity were found in the nicotine produced by the roots during their growth. It is thought probable that the pyridine ring of nicotinic acid is a biosynthetic precursor of the pyridine ring of nicotine and nornicotine and perhaps also of other related tobacco alkaloids. This work, considered in conjunction with that of Dewey *et al.* [preceding abstract] and Leete [*H.A.*, 26: 2999], affords the first recorded evidence of the biosynthetic pathway of a plant alkaloid. It is also noteworthy that a universally distributed cofactor of biological catalysts and an important amino acid metabolite should prove to be involved as intermediates in the synthesis of one of a class of substances for which no biochemical or physiological significance has yet been adduced.—Dep. Bot., Columbia Univ., N.Y., and Brookhaven nat. Lab., L.I., N.Y.

3873. Iljin, G. S.
The synthesis of nicotine-C^{14} in tobacco seedlings. [Russian, with English summary 5 lines.]
Biohimija, 1956, **21**: 108-10, bibl. 15.

When germinating tobacco seeds and seedlings were grown in Knop's solution supplied with $NaHC^{14}O_3$, nicotine-C^{14} was synthesized both in light and in darkness.

3874. Iljin, G. [S.].
The biosynthesis of nornicotine-C^{14} and anabasine-C^{14}. [Russian.]
Doklady Akad. Nauk S.S.S.R., 1955, **105**: 777-8, bibl. 3.

In *Nicotiana glutinosa* plants, deprived of their roots and cultured in Knop's solution with $NaHC^{14}O_3$, anabasine-C^{14} was synthesized but nornicotine-C^{14} was not. In whole plants both alkaloids were synthesized.

3875. Leete, E.
The biogenesis of nicotine and anabasine.
J. Amer. chem. Soc., 1956, **78**: 3520-3, bibl. 38.

The metabolism of lysine-2-C^{14} in nicotine-producing *Nicotiana tabacum* and in anabasine-producing *Nicotiana glauca* has been studied. The nicotine isolated from the plants was inactive, but the anabasine was radioactive. Systematic degradation of the anabasine (2-(3-pyridyl)-piperidine) indicated that all the radioactivity resided in the α-carbon atom of the piperidine ring attached to the pyridine ring. The significance of these results is discussed. [Author's abstract.]—Dep. Chem., Univ. Calif., Los Angeles.

3876. Giovannozzi-Sermanni, G., and Scarascia-Venezian, M. A.
Ricerche analitiche in *Nicotiana rustica* con cromatografia su carta: modificazioni di alcune sostanze di reserva in semi di diversa età. (**Paper-chromatographic analysis of *Nicotiana rustica:* variations in content of some reserve substances in seeds of different ages.**) [English summary 14 lines.]
Tabacco, 1956, **60**: 71-7, bibl. 8, illus.

Analyses of seeds of different ages of *Nicotiana rustica* var. Tombac showed that: (1) The amino acid content declines significantly with increasing age, some amino acids disappearing altogether and others appearing as a result of partial hydrolysis of proteins. (2) In seed which has lost its viability tryptophane, sucrose and maltose are absent and valine is present. (3) Lipase activity and the iodine number are greater in old seed.

Climatic injury.

3877. McLeod, A. G.
A note on wind damage to tobacco.
N.Z. J. Sci. Tech., Sect. A, 1956, **37**: 535-7, bibl. 1.

In December, 1954, tobacco plants, about 4 in. high, were damaged by high winds alone or by wind-borne soil particles. Recovery was fairly good, but maturity was delayed where damage was severe. Contrary to expectation the incidence of mosaic and of dwarfed plants was lower in areas which had suffered serious abrasive damage than in less severely damaged areas. By contrast where plants were damaged only by wind there was a high incidence of mosaic and no dwarfed plants occurred.—Tob. Res. Stat., D.S.I.R., Motueka.

3878. Burk, L. G., and Heggestad, H. E.
Weather fleck on *Nicotiana tabacum.*
Plant Dis. Reptr, 1956, **40**: 424-7, bibl. 4, illus.

Observations suggest that weather fleck, a physiological leaf spot disorder, resulted from a cellular breakdown conditioned by environmental factors. Damage varied between varieties. Maryland Medium, the most resistant variety, imparted a high level of resistance to its hybrids.—U.S. Dep. Agric., Beltsville, Md.

Diseases and pests.

(*See also* 3765, 3856o, 3892g, q.)

3879. Harrison, B. D.
Studies on the effect of temperature on virus multiplication in inoculated leaves.
Ann. appl. Biol., 1956, **44**: 215-26, bibl. 15.

The rate at which Rothamsted tobacco necrosis virus accumulates in inoculated french bean leaves increases with rising temperature to 22° C. and then decreases, probably because inactivation becomes increasingly important as the temperature rises above 22° C. At temperatures of 30° C. and below, tomato aucuba mosaic virus produces necrotic lesions in leaves of tobacco and *Nicotiana glutinosa*, whereas above 30° C. the lesions are chlorotic.—Rothamsted exp. Stat.

J.R.L.

3880. Owen, P. C.
The effect of infection with tobacco mosaic virus on the respiration of tobacco leaves of varying ages in the period between inoculation and systemic infection.
Ann. appl. Biol., 1956, **44**: 227-32, bibl. 4.

Leaves of tobacco plants inoculated with tobacco mosaic virus were divided into three groups: (*a*) inoculated leaves; (*b*) younger non-inoculated leaves present at the time of inoculation; (*c*) leaves formed since inoculation. The respiration rate of each group was compared with that of similar leaves from healthy plants. The respiration rate of inoculated leaves was increased by a constant amount for 3 weeks after inoculation, when it decreased. The respiration rate of group (*b*) leaves was not affected at any time, and that of group (*c*) leaves was decreased by 10% when they showed symptoms. The increased respiration in the inoculated leaves occurred too soon to reflect virus formation, and it is suggested that it reflects an initial change in infected cells preparatory to virus synthesis. The subsequent decrease in respiration may be due to the accumulation of virus which does not contribute to the total leaf respiration. [Author's abstract.]—Rothamsted exp. Stat.

3881. Hitier, H., and Izard, C.
Recherches sur les moyens de lutte contre le feu sauvage du tabac. **(Studies on the control of wildfire in tobacco.)**
Ann. Inst. exp. Tabac de Bergerac, 1956, **2**(2): 43, from abstract card *Inst. Tabakforsch., Dresden*, No. 56/287.

Wildfire in tobacco was controlled to a certain extent by 0·2% copper acetate. Promising control was obtained with streptomycin at 10^{-4} to 10^{-3}. Repeat applications are necessary.

3882. Mathrani, D. I., and Elias, N. A.
Anthracnose of tobacco in India.
Indian Tobacco, 1956, **6**: 37-8, illus.

Anthracnose, *Colletotrichum tabacum*, has become serious since it first appeared in Andra State in 1951. Perenox at 2 oz./10 gal., bordeaux at 2–2–50, Dithane Z-78 at 0·15% and Fermate at 0·09% have all given control, but the last two have proved the most satisfactory.

3883. Todd, F. A.
Tobacco blue mold and anthracnose control.
Ext. Circ. N.C. agric. Ext. Serv. **397**, 1956, pp. 11, illus.

A brief general account is given of the symptoms and transmission of the diseases. Night temperatures of 50°–60° F. favour blue mould, particularly if humidity is high. Anthracnose requires 60°–70° F. for rapid development. Spray and dust treatments of plant beds with different forms of ferbam, zineb and maneb are described in detail.

3884. Anderson, P. J.
Streptomycin for control of blue mold and bed rot of tobacco.
From abstr. in *Phytopathology*, 1956, **46**: 240.

Both streptomycin sprays at 200 and 400 p.p.m. applied once or twice a week and Dithane Z-78 (65% zineb) gave good control of blue mould (*Peronospora tabacina*) in tobacco beds. Bed rot (*Pythium aphanidermatum*) was controlled perfectly by Dithane Z-78 at 2 lb. per 50 gal. water applied twice weekly, but streptomycin had no effect.

3885. Boush, G. M., Starks, K. J., and Thurston, R.
Control of green peach aphid on burley tobacco.
J. econ. Ent., 1956, **49**: 24-7, bibl. 4.

In tests with 8 non-systemic insecticides, applied in the laboratory as sprays and in the field as dusts, parathion and chlorthion were the most effective against *Myzus persicae* on burley tobacco, resulting in at least a 95% reduction of aphids compared with untreated checks 2 days after treatment. In a laboratory test on 5 systemic insecticides applied at 50 p.p.m., Am. Cyanamid 12008 and 3911, Shell OS-2046 and demeton resulted in a similar reduction in aphid populations.—Univ. Kentucky, Lexington.

3886. Rabb, R. L., and others.
The effect of placement of insecticidally treated transplanting water on the control of wireworms in tobacco.
J. econ. Ent., 1956, **49**: 256-9, bibl. 3, illus.

Tests were carried out to obtain data on the effectiveness of hand and mechanical setters in applying treated transplanting water to newly-set tobacco for wireworm control. Although the results were variable it was found that: (*a*) setting water treatments applied with hand setters gave excellent protection; (*b*) similar treatments applied with a mechanical setter were usually unsatisfactory even if 400 gal. of treated water was used in place of 200 gal.; (*c*) control was improved if an accessory water placement valve was attached to the mechanical setter, but it was still not so good as with hand setting. Heptachlor was used and it was found that the emulsifiable concentrate gave consistently better wireworm control than the wettable powder.—N.C. agric. Exp. Stat. J.R.L.

Harvesting and curing.

(*See also* 3892d, e, l, n.)

3887. Wilson, R. W.
Mechanizing flue-cured tobacco harvest.
Agric. Engng St. Joseph Mich., 1956, **37**: 407-10, illus.

In the U.S.A. approximately 480 man-hours are needed to produce 1 acre of flue-cured tobacco, of which about 165 man-hours are needed for the various harvesting operations ranging from priming to placing in barns for curing. Tests on mechanical defoliators are described, in which damage both to harvested and unharvested leaves was assessed. Total damage in one case amounted to 5·4% and in another to 5·1%, but in both cases modifications should make it possible to reduce damage to below 4·5%. Investigations are also in progress on the mechanical stringing and hanging of leaves.

3888. Shepherd, J. L.
Control in tobacco curing. Barn construction and management.
Mimeo. Ser. Ga agric. Exp. Stat. **N.S.17,** 1956, pp. 8, illus.

Several years' research by the Agricultural Engineering Department of the Georgia Coastal Plain Experiment Station on flue-curing barn construction and management have led to the development of a new, adjustable top ventilator and other improvements in design. With the aid of a hygrometer the relative humidity in the barn can be readily controlled by adjusting the ventilator. Sectional plans are provided of a barn and of the ventilator and a recommended curing procedure is outlined.

3889. Gutierrez, M. E.
The 1952 model flue-curing barn at the Los Baños Tobacco Project Economic Garden, Laguna.
Philipp. J. Agric., 1954 (issued 1955), **19**: 61-80, bibl. 5, illus.

This flue-curing barn, which is described with the aid of detailed plans, is the latest and best of a series of barns constructed on experiment stations in the Philippines since 1930. Various materials ranging from wood to reinforced concrete may be used for the walls, and for five of these materials bills of quantities are provided for barns 5 m. × 5 m. × 5 m. in size.

3890. Riches, R. C. B.
A home-made humidifier.
Rhod. Tobacco, 1956, No. 12, p. 6, illus.

The author describes his home-made humidifier which works satisfactorily at steam pressures of up to 20 lb./sq. in., and is very cheaply made. Water from a small tank is mixed with steam from the boiler. A diagram is supplied. J.R.L.

3891. Wada, E.
Conversion of nicotine to nornicotine in Cherry Red tobacco during flue-curing.
Arch. Biochem. Biophys., 1956, **62**: 471-5, bibl. 10.

A substantial conversion of nicotine to nornicotine was observed in the Cherry Red strain of Bright Yellow variety of tobacco during flue-curing. The Red Free strain of the same variety shows no such conversion. [Author's summary.]—Centr. Res. Inst., Japan Monopoly Corp., Tokyo.

Noted.

3892.

a Crouse, R. H., and others.
Aromatic tobacco production in North Carolina.
Ext. Circ. N.C. agric. Ext. Serv. **375**, revised 1956, pp. 14, illus.
Soils, manures, transplanting, cultivation, harvesting, curing and storage.

b Dutta, G.
Location of tobacco industry in India.
Indian Tobacco, 1956, **6**: 29-34, bibl. 8.
Types of tobacco, factories and by-products.

c Endemann, W., and Weidemann, C.
10 Jahre Tabakforschung 1946-1956. **(10 years of tobacco research, 1946-1956.)**
Ber. Inst. Tabakforsch. Dresden, 1956, 3(1): 5-18, bibl. 42, illus.
Research in Eastern Germany reviewed.

d Fleming, R. W.
Improved lay-out for tobacco buildings.
Rhod. Tobacco, 1956, No. 12, pp. 6-7, illus.
A grower describes his buildings with the aid of a plan.

e Fritzsche, J.
Praktische Möglichkeiten einer Verkürzung der Trockenzeit in den Tabakheissluft Trocknungsanlagen. **(Possibilities of reducing the time of curing tobacco in flue-curing barns.)** [English and Russian summaries 7 lines each.]
Ber. Inst. Tabakforsch. Dresden, 1956, 3(1): 115-22, bibl. 4.
A discussion of conditions needed to complete curing in 48–52 hours.

f Giraud, E.
Progrès récents dans la culture du tabac en France. **(Recent progress in tobacco growing in France.)**
Rev. int. Tabacs, 1956, **31**: 99-107, 134-9.
A survey of administrative and technical development.

g Gutierrez, M. E.
Observations on an unusual symptomatic expression of tobacco mosaic on inoculated Ky 52 (White Burley) and F_1 hybrids thereof.
Philipp. J. Agric., 1954 (issued 1955), **19**: 97-103, bibl. 5, illus.
Stem and leaf necrosis on a variety previously considered resistant to TMV.

h Gutierrez, M. E.
The tobacco breeding program of the Bureau of Plant Industry.
Philipp. J. Agric., 1954 (issued 1955), **19**: 81-95, bibl. 10, illus.
A survey of recent work in the Philippines.

i Gutierrez, M. E.
Production of quality Virginia leaf tobacco.
Rev. int. Tabacs, 1956, **31**: 129-33, bibl. 6.
In the Philippines.

j Haviland, W. E.
Flue-cured tobacco farming in Quebec and Ontario. Comparative efficiency and wages of labour.
Agric. Inst. Rev., 1956, **11**(3): 15-16, 20, illus.
With special reference to harvesting costs.

k Moore, E. L., and Drolsom, P. N.
Dixie Bright 244 shows progress towards multiple resistant varieties.
Res. and Fmg, N.C., 1956, **14**(3/4): 4-5, illus.
Combining high yields, quality and disease-resistance.

l Müller, O.
Untersuchungen über die Temperatur im Tabak beim Trocknen in der Aufbereitungsmaschine und Messungen der relativen Luftfeuchtigkeit. **(Studies on the temperature in tobacco in re-drying machines and methods of measuring the relative atmospheric humidity.)** [English and Russian summaries 7 lines each.]
Ber. Inst. Tabakforsch. Dresden, 1956, 3(1): 123-36.

m Patel, M. S., and Ramaratnam, D. S.
Indian tobacco in the world market.
Indian Tobacco, 1956, **6**: 21-7.
Data on exports.

n Philipp, W.
Die Anwendung infraroter Strahlen zur Feuchtigkeitsbestimmung beim unfermentierten Rohtabak. **(The use of infra-red radiation to determine the moisture content of unfermented, raw tobacco.)** [English and Russian summaries 16 and 18 lines.]
Ber. Inst. Tabakforsch. Dresden, 1956, 3(1): 88-114, bibl. 8.

o Pyriki, C., and Kunstmann, F. W.
Beitrag zur quantitativen Erfassung der organischen Säuren im Tabak. **(Contribution to the quantitative determination of organic acids in tobacco.)** [English and Russian summaries ½ p. each.]
Ber. Inst. Tabakforsch. Dresden, 1956, **3**(1): 60-76, bibl. 10.
Methods for determining oxalic and other acids.

p Saltman, P., and Kunitake, G.
The dark fixation of CO_2 by tobacco leaves.
From abstr. in *Plant Physiol.*, 1956, **31** (Suppl.): xxii.

q Whitcomb, W. H.
Plagas del tabaco en Venezuela. **(Tobacco pests in Venezuela.)**
Inf. Serv. Shell Agric. Venezuela, Ser. A, **3**, 1955, pp. 31, bibl. 9, illus.
Biology and control, with spray programmes for seed bed and field.

MISCELLANEOUS TEMPERATE AND TROPICAL PLANTS.

Drugs and antibiotics.

(*See also* 3316c, 3408y, 3597u, 3696, 3916, 3939j, r-u, 3940c, d, 3967, 4279.)

3893. Chládek, M., and Rod, J.
Příspěvek k pěstování a šlechtění ibišku (*Althaea officinalis* L.). **(A contribution to the cultivation and breeding of *Althaea officinalis*.)** [Russian and German summaries 8 and 7 lines respectively.]
Sborn. čsl. Akad. Zeměd., 1956, **29**: 43-58, bibl. 53, illus.

Vegetatively propagated plants of *Althaea officinalis* grown as an annual crop produced higher yields of drug-bearing roots than seedlings grown as a biennial crop. Of 15 specimens studied plants with a tall growth habit produced the highest yield of fresh roots and dry drugs and were most easily propagated by crown shoots. This type of plant also appeared more resistant to rust, *Puccinia malvacearum*, and to *Podagria fuscicornis*, which damages the roots, than plants with a low growth habit.

3894. Radomir, S., Dev, S., and Sirsi, M.
Chemistry and antibacterial activity of nut grass.
Curr. Sci., 1956, **25**: 118-19, bibl. 4.

Infusions prepared from the tubers of *Cyperus rotundus* possess medicinal properties, but it is not known whether these are due to the essential oil or to non-volatile constituents. In the investigation summarized here oil yield ranged from 0·3 to 0·5%. The physical properties of 4 samples and of fractional distillates are tabulated. In tests against 7 bacteria the oil inhibited growth in one case only.—Indian Inst. Sci., Bangalore.

3895. Dawson, R. F., and James, C.
Alkaloids of *Papaver orientale* L. I. Qualitative detection and occurrence.
Lloydia, 1956, **19**: 59-64, bibl. 6.

Recent work at Columbia University, N.Y., is summarized as follows: One-dimensional linear and circular paper chromatographic methods for the separation and detection of the alkaloids thebaine and isothebaine in less than single plant samples of *Papaver orientale* L. are described. These methods were applied to seedling and to clonally propagated populations, and qualitative variations in alkaloid distribution are reported. Isothebaine appeared to be the major alkaloid in all cases. At least two other alkaloids of unknown identity were detected on the chromatograms of some plants.

3896. Van Etten, C. H., and others.
Ion exchange separation of morphine prior to its determination in *Papaver somniferum*.
Analyt. Chem., 1956, **28**: 867-70, bibl. 19.

There being no quick, accurate method of determining morphine in the poppy plant or its extracts, a new procedure by ion exchange methods has been developed. An account of it is given here. The morphine was finally measured by the colour it produces with nitrous acid, by its ultra violet absorption, or by titration.—North. Utiliz. Res. Br., U.S.D.A., Peoria, Ill.

3897. Zatulovskiĭ, B. G.
Antibiotic properties of *Parmelia vagans*. [Russian.]
Priroda, 1956, **45**(5): 100-1.

Usninic acid obtained from the lichen *Parmelia vagans* inhibits certain animal pathogens and was also found effective against some bacterial diseases of plants, notably bacterial canker of tomato. Tomato seeds soaked for 18 hours in a 1: 1,000 solution of usninic acid produced normal plants.

3898. Badhwar, R. L., and others.
***Rauwolfia serpentina*. The wonder drug of India.**
Indian For. Leafl. **142**, 1955, pp. 10, from *Trop. Abstr.*, 1956, Vol. **11**, abstr. d1534.

The authors have found that there is no significant difference in the yield of total alkaloids between roots grown under irrigated agricultural conditions and under forestry conditions. Details are given on cultivation. A 2-year-old plantation may yield about 2,000 lb. of air-dry roots per acre.

3899. Taylor, C. A.
The culture of false hellebore.
Econ. Bot., 1956, **10**: 155-65, bibl. 6.

Germination of *Veratrum viride* and *V. eschscholtzii* was prompt after 4–4½ months' stratification at 35°–40° F. Dormancy of *V. californicum* seeds was broken after stratification for 3 months. Seeds of *V. fimbriatum* germinated after treatment at 40°–45° F. for 2–2½ months. Seeds of *V. viride* and *V. eschscholtzii* showed slightly higher germination percentages in strong than in weak light. *V. viride* seeds were stored for 2 years at 40° F. in sealed containers. No method of storing *V. fimbriatum* seed was found. In greenhouse tests a covering of clean sand resulted in the best emergence of *Veratrum* seeds; results in the open were more variable. Trials on vegetative propagation using severed crown buds did not give very successful results, except in one trial with *V. fimbriatum*, when there was

80% survival in the third growing season. Attempts to use bulbils as propagating material were unsuccessful. *Veratrum viride* plants grown in pots did not respond to P or K_2O, but growth was significantly reduced by N application.

3900. Taylor, C. A.
Alkaloid yields of *Veratrum fimbriatum* as influenced by site, season and other factors.
Econ. Bot., 1956, **10**: 166-73, bibl. 3.

Veratrum fimbriatum plants dug during or shortly before initial top growth in early spring contained nearly twice as much crude alkaloid as when dug in July. Rootstocks dug during the period of high alkaloid content were held until May in conditions allowing no root growth without any apparent loss of alkaloids. The alkaloid content varied considerably from one plant to another.

Essential oils.

(*See also* 3894, 3939a, w, 3940a.)

3901. Rabson, R., and Steward, F. C.
Some effects of environment during growth on the metabolites of *Mentha piperita*.
From abstr. in *Plant Physiol.*, 1956, **31** (Suppl.): iv.

Uniform mint plants in culture solutions were exposed to different day lengths and night temperatures. Long days and low night temperatures promoted the accumulation of α-ketoglutaric acids in contrast to short days and high night temperatures.

3902. Biggs, R. H., and Leopold, A. C.
The effects of temperature on peppermint.
Proc. Amer. Soc. hort. Sci., 1955, **66**: 315-21, bibl. 9, illus.

The length of time required for peppermint plants to initiate flowers was greatly influenced by small changes in temperature. The optimum temperature for flower initiation occurred between 70° and 80° F. Raising either the night or the day temperature increased the number of oil glands per unit area of lower leaf surface. The oil content of the plant did not increase with the frequency of oil glands at the highest temperatures, presumably owing to volatilization of the oil. Plants grown at low temperatures (60° F.) had many stolons and recumbent shoots, whereas plants grown at higher temperatures had few stolons and no recumbent shoots. —Purdue Univ., Lafayette, Ind.

3903. Anon.
Ensayos de orientación en la lucha contra el pulgón de la menta. (**Preliminary trials on control of the mint aphid.**)
Idia, 1956, No. 98, p. 31.

Good control of *Klatemblachiella menthae* on peppermint was given by applications of Systox, 50% emulsion, to plants and soil.

3904. Ahlgrimm, E.-D.
Beiträge zur Frage der Biogenese sekundärer Stoffwechselprodukte dargestellt an *Mentha piperita* L. und an *Fagopyrum*-arten. (**Contributions to the question of biogenic secondary growth-substance products as shown in *Mentha piperita* and *Fagopyrum* species.**)
Planta, 1956, **47**: 255-98, bibl. 112.

Oil from younger leaves of *Mentha piperita* had a higher menthone and a lower menthol content than oil from older leaves. As the leaves developed the menthol content increased and the menthone content decreased. On a fresh weight basis young leaves contained more oil than older leaves. The changes in oil composition with wilting were greater in young leaves than in older leaves. Sunlight favoured oil formation; the menthol content of oil from illuminated leaves was lower and the menthone content higher in oil from shaded leaves. Oil composition was greatly influenced by temperature during wilting and drying, the greatest changes occurring at 20°–30° C.

3905. Kahl, W. H., and others.
An investigation of some factors affecting distillation of peppermint oil.
Quart. Bull. Mich. agric. Exp. Stat., 1956, **38**: 570-9, bibl. 5, illus.

The efficiency and consistency of oil recovery from peppermint hay by use of an experimental still was determined by the oil-on-water method. Recovery of peppermint oil averaged 92%; a steam flow of 250–400 lb. per hour gave the best results. Oil yields increased with maturity to an optimum and then decreased. Curing the hay for 3–4 days reduced the time needed for distillation by about one-third.

Fibres.

(*See also* 3939c, m, y, 4279.)

3906. Regel, C.
On some herbs containing cellulose in Iraq.
Maveg., 1956, **2**: 53-7, bibl. 5.

The grasses *Demostachya bipinnata*, *Erianthus ravennae* and *Imperata cylindrica* are of possible value in paper-making.

3907. Khan, A. H., and Hussain, G.
***Ipomoea superba* G. Don (sada sohagan) a fibre and oil-bearing plant of the Punjab.**
Khan, A. H., and Farid, A. J.
Studies in fibre quality of *Ipomoea superba* G. Don.
Khan, A. H., and Ahmad, N.
Studies in physical and chemical nature of seeds of *Ipomoea superba* G. Don.
From abstrs in *Proc. 6th Pakistan Sci. Conf., Karachi, 1954, Part III*, pp. 5-6, 6-7 and 7, and first article in *Pakistan J. Sci.*, 1956, **8**(1): 41-2.

I. superba, a common wild plant in the Punjab, is described. The seed yields 2·64% of a fine, lustrous fibre, suitable for use as a stuffing material but too short for spinning, and also contains 14·28% oil, 9·98% protein and 16·99% K_2O.—Res. Inst., Lyallpur.

3908. Ure, J. S.
Manila hemp: a variety trial at the Federal Experiment Station, Serdang.
Malay. agric. J., 1955, **38**: 256-61, bibl. 3.

In a variety trial of 6 varieties of Manila hemp discussed, the 2 best-yielding varieties were Tangongon and Serdang C. The former, producing fewer but larger stems of high fibre content, should be the better economic proposition.

3909. Medina, J. C.
Variegação em *Agave sisalana*. (Variegation in *Agave sisalana*.) [English summary 2 lines.]
Bragantia, 1955, **14**: xxvii-xxviii, bibl. 2, illus.

Two variegated forms, the first to be reported for *Agave sisalana*, are described. One is of the *marginata* and the other of the *medio-picta* type.

Hops.

3910. Ehara, K.
Comparative morphological studies on the hop (*Humulus lupulus* L.) and the Japanese hop (*H. japonicus* Sieb. et Zucc.). I and II. [In English.]
J. Fac. Agric. Kyushu Univ., 1955, **10**: 209-32, illus., and 307-24, bibl. 24, illus.

A detailed morphological study of these two species of *Humulus* has shown a number of essential differences. *H. lupinus* is a perennial producing underground runners and is propagated from cuttings. *H. japonicus* is an annual with no rhizomes and is propagated by seed. Both are right-hand twiners and have double and single hooked hairs on stem, petiole and leaf veins. Both have similar stems and leaves with hairs and glands. Both are dioecious with similar cones, except that, whereas the hop has 20 to 30 stipular bracts with double that number of bracteoles, the Japanese hop has only 10 to 16 bracts with one bracteole to each. The Japanese hop has no lupulon gland and cannot therefore be used for brewing purposes. Morphological and anatomical details are very fully illustrated.
J.R.L.

3911. Nečiporčuk, J. D.
The problem of altering hops by means of training. [Russian.]
Doklady vsesojuz. Akad. seljsk. Nauk, 1956, **21**(6): 15-17, illus.

To simplify hop cultivation attempts were made at the Lvov Agricultural Institute to transform the annual aerial stems into perennial ones. This was accomplished by enclosing a growing stem for a season in a tarred paper tube with only 2–3 pairs of the upper leaves showing. Plants with perennial stems are now in their 4th year; they produce annual side shoots which are shorter than shoots of the normal hop plant. The transformation described was carried out on vegetatively propagated plants and work is in progress now on seedlings.

3912. Emery, G. A.
New techniques for the control of pests on hops.
J. Sci. Food Agric., 1956, **7** (Suppl.): 110-15, bibl. 5.

Experiments are described which demonstrate the value of a single soil application of dimefox for the control of *Phorodon humuli* and *Tetranychus telarius*. The addition of hexamethylphosphoramide ("tris") to the dimefox preparation has been found to enhance its insecticidal action.

3913. Howard, G. A., and Tatchell, A. R.
Development of resins during the ripening of hops.
J. Inst. Brew., 1956, **62**: 251-6, bibl. 14.

A study of the detailed composition of hops during ripening shows that, even from the early burr stage (5 to 6 weeks before picking), the α-acids and β-acids appear simultaneously. Their rates of increase are greatest during the first half of the period before picking and are similar throughout. Of the individual constituents of the resins, cohumulone, adhumulone, colupulone, lupulone and adlupulone are all present from the earliest stage examined. However, the proportions of cohumulone in the α-acids and of colupulone in the β-acids are initially lower than those characteristic of the variety, but they increase concurrently until they reach the expected levels some time before the hops are considered to be ripe. [Authors' abstract.]

3914. Bullis, D. E.
Cone breakage—its relation to hop quality.
[French and Spanish summaries.]
Wallerstein Labs Commun., 1956, **19**: 23-30, bibl. 2.

Analyses of random samples of commercial hops from the hop inspection services of California, Idaho, Oregon and Washington have been used to illustrate the extent to which cone breakage may affect hop quality. For the crop examined (1950) cone breakage averaged from 30% to 44% depending on variety and state of origin. Broken cones averaged about ⅓ less α-resin and about ¼ less total soft resin than whole cones. These proportions did not vary greatly among the states. Even more important to the user of hops is the fact that the soft resins from broken cones contain a lower proportion of α-resin than the soft resins from whole cones. Weight for weight soft resins from whole cones have greater preservative, brewing or bittering value than those from broken cones, when these factors are calculated by the commonly accepted formulae. Experimental lots of hops in which breakage was partially controlled showed the same trends in quality as the commercial samples. Even though the range in amount of cone breakage in the experimental lots was only about 5%, there was a very significant statistical difference in α-resin and total soft resin content favoring the less damaged lots. As with the commercial lots, the quality of the soft resins in the experimental lots seemed to decrease as the cone breakage became more severe. It thus appears that cone breakage may be a much more influential factor in hop quality than has been realized. The advent of mechanical pickers and the consequent need of production-line schedules for drying and baling have been responsible for much of the increase in breakage that has been experienced in recent years. [From author's summary.]

3915. Cook, A. H., Howard, G. A., and Slater, C. A.
Chemistry of hop constituents. IX. Isomerization of humulinone and cohumulinone.
J. Inst. Brew., 1956, **62**: 220-1, bibl. 7.

Humulinone and cohumulinone have been isomerized by means of silica gel. Examination of the products leads to the view that the "humulinone complex" consists of a mixture of *iso*humulinone and *iso*cohumulinone. [From authors' abstract.]

Insecticidal plants.

(*See also* 3939d-g, i, n, x.)

3916. Koroleva, N. I.
The use of some plant insecticides. [Russian.]
Sad i Ogorod, 1956, No. 6, pp. 60-1, illus.

Notes are given on when to collect *Veratrum album*, *Hyoscyamus niger* and an *Aconitum* sp. and how to prepare infusions from them which are poisonous to many orchard insects. Spray applications of infusions from *V. album* were particularly effective against caterpillars on apples, from *H. niger* against aphids on various fruit plants and from *Aconitum* sp. against green apple aphid.

Rubber plants.

(*See also* 3939q, v.)

3917. Kalantyrj, M. S.
***Eucommia* culture in the U.S.S.R.** [Russian.]
Priroda, 1956, **45**(5): 98-100, illus.

The gutta percha content in the different organs of *Eucommia ulmoides* varies from 1% of dry matter in the flowers to 8–14% in the fruit. Fallen leaves (3–7% gutta percha) in a 5- to 7-year-old plantation provide about 100 kg. gutta percha per ha. The root and stem bark of the plant also contains a valuable drug. *Eucommia* growing is now being extended in Georgia, Tadžikistan and the Krasnodar region.

3918. Fiedler, J.
Studium koksagyzu jako podklad pro získání základního šlechtitelského materiálu. **(Fundamental studies on kok-saghyz for obtaining basic breeding material.)** [English and Russian summaries ¾ p. each.]
Sborn. čsl. Akad. Zeměd., 1956, **29**: 83-106, bibl. 37.

During a detailed study of kok-saghyz in Czechoslovakia it was found that seed stratified for 20 days at −1° to 1° C. and sown in the spring at 3–4 kg./ha. in groups each occupying 150 sq. cm. gave the best results. For rubber production 1-year-old plants were better than 2-year-old plants, which are used mainly for seed production. Kok-saghyz grew best in soils of pH 6·5 to 7·5 supplied with 4 quintals [1q. ≡ 100 lb. or 1 cwt.] superphosphate, 2 q. ammonium sulphate and 2–3 q. potassium salt per hectare. Vigorous plants with well developed leaf rosettes withstood −25° C. but others were killed even at −5° C. A description is given of morphological differences between kok-saghyz and dandelion which makes it possible to distinguish them at harvest time. Commercial cultivation is not at present contemplated.

3919. Reĭngard, T. A.
Post-harvest rubber formation in the roots of rubber-bearing plants. [Russian.]
Trud. Inst. Fiziol. Rast. Timiryazeva, 1955, **9**: 215-41, bibl. 90.

Studies with 1-year-old kok-saghyz and krym-saghyz plants have shown that rubber accumulation continued after harvest and was due to the growth of globules in the latex. The rate of post-harvest rubber synthesis was found to depend on the condition of the plants at harvest and on the storage conditions of the roots. Rubber was most readily synthesized by the roots of plants which had been grown under conditions favourable for rubber synthesis during growth. Rubber synthesis was aided by brief curing and storage at 10–15° C. in an atmosphere containing 5–10% CO_2.

Seed oils.

(*See also* 3907, 3939k, p.)

3920. Peterson, A. S.
Castor bean research in New South Wales.
Agric. Gaz. N.S.W., 1956, **67**: 29-33, 144-7, illus.

Since 1947 dwarf varieties have been grown under inland irrigation conditions, using standard wheat machinery for harvesting. Varieties suitable for mechanical harvesting have not yet been found but breeding is continuing. Three of the more promising varieties are Kerripi Wild, Mauthners Dwarf and U.S.4. Pentachlorphenol in creosote and 2,4-D in dieselene have induced artificial maturity.

3921. Canecchio (Filho), V.
Resultados de experiências de espaçamento da mamoneira anã, variedade 1.A.38. **(Results of spacing experiments with dwarf castor-oil plants of variety 1.A.38.)** [English summary 9 lines.]
Bragantia, 1954, **13**: 297-305, bibl. 3.

Experiments lasting five years comprised 16 sowings in 6 localities, the rows being 1–2·5 m. apart and the plants 0·45–2 m. apart. The highest yields were obtained from rows 1 m. apart with plants 0·45–0·9 m. apart. Close spacing reduced weed growth.

3922. Junges, W., add Büttner, G.
Saatgutbehandlung und Anbautechnik von Rizinus. **(Seed treatment and cultivation of the castor bean.)**
Reprinted from *Pharmazie*, 1955, **10**: 615-20, bibl. 12, illus.

The juvenile stage in castor bean plants was shortened both by seed vernalization (at 3° C.) and by growing the plants in a light soil. Under German conditions, young plants started in pots under glass showed better vegetative growth than those sown directly in open ground. Seed yields from plants grown in a sandy loam were about double those from plants in a sandy soil. Seed yields from plants with 4 ovules per fruit were 60–70% higher than those from plants with twin-ovuled fruits. Treatment of seeds for 2 days at 35° C., plus 3 days in moist conditions at room temperature, plus 1 day for drying at 35° C. increased germination by 26–57%, largely due to control of *Pseudomonas solanacearum*. This treatment also resulted in increased seed number per plant and higher seed weight.—Inst. Gartenb., Dresden-Pillnitz.

3923. Kromer, G. W., and others.
Economic factors in marketing farmers' castorbeans.
Marketing Res. Rep. U.S. Dep. Agric. **106**, 1955, pp. 46.

A detailed study of the castor bean crops produced in the U.S.A. during 1951–54 has shown that there is no deterioration in the oil of beans stored for 2 years, that cracked and broken beans yield a higher percentage of oil than whole beans (owing to the loss of pieces of the seed coat) and that the oil content of different varieties differed significantly. Because the farmer is paid a price based on bean yield with reductions for foreign material, cracked and broken beans and moisture, and not on the yield of oil, he is not encouraged to grow the best oil varieties. J.R.L.

3924. PARKEY, W., WEBSTER, J. E., AND VAN HORN, D. L.
The nitrogen, phosphorus, potassium and ash content of castor bean hulls.
Tech. Bull. Okla. agric. Exp. Stat. **T-61**, 1956, pp. 11, bibl. 1, illus.

The average analysis of castor bean hulls for all varieties and locations was: N, 1·64%; P, 0·82%; K, 3·81%; and ash 10·38%. No important variation among varieties was noted for any of the components. The greatest variation within components occurred between years and locations. There were differences between samples of hulls from irrigated and non-irrigated plots. Apparently, the environment prevailing during each of the growing seasons was an important factor governing the percentage of inorganic chemical components deposited in the hulls. [From authors' summary.]

3925. MARKLEY, K. S.
Mbocayá or Paraguay cocopalm—an important source of oil.
Econ. Bot., 1956, **10**: 3-32, bibl. 22, illus.

The mbocayá palm (*Acrocomia totai*) is described in detail and its distribution in Paraguay surveyed. The kernel oil is more important commercially than the pulp oil, and has a higher iodine value and a lower melting point than other palm kernel and coconut oils; the pulp oil has a high percentage of free fatty acids. In addition to the oils, the kernel meal, kernel cake and extracted pulp are of economic value. [See also *H.A.*, 26: 853.]

3926. KHAN, K. F., AND GOPALAKRISHNAN, P. K.
The oysternut—a new industrial nut crop for South India.
S. Indian Hort., 1955, **3**: 100-3, bibl. 3, illus.

Trials at Wynaad with the oysternut (*Telfairia pedata*) have shown promise. Hand pollination resulted in 96% fruit set. The nuts contained 65% of a non-drying vegetable oil. It is suggested that the crop could be grown in unreclaimed forests by encouraging it to trail over standing trees.

3927. RIEDL, W. A.
Safflower in Wyoming.
Bull. Wyo. agric. Exp. Stat. **332**, 1955, pp. 10, bibl. 7.

In Wyoming safflower has yielded about 1,500 lb. seed per acre with irrigation and 600 to 800 lb. without. Recommendations are made on time and depth of sowing, seed rates and spacing, and cultivation, irrigation and harvesting. The results are given of variety trials in which N-6 proved best under irrigation and N-10 under dry conditions.

3928. HAKIM, M. A., AND KARIMULLAH.
A new substitute for coconut oil in soap production.
From abstr. in *Proc. 6th Pakistan Sci. Conf., Karachi, 1954, Part III*, pp. 193-4.

The seeds of *Salvadora oleoides*, a common tree in Pakistan, contain about 45% fat, the main characteristics of which are given. The fat is superior to coconut oil for soap production.—Univ. Inst. Chem., Lahore.

Sugar maples.

3929. MARVIN, J. W., AND ERICKSON, R. O.
A statistical evaluation of some of the factors responsible for the flow of sap from the sugar maple.
Plant Physiol., 1956, **31**: 57-61, bibl. 9, illus.

Hourly data on the flow of sap from three sugar maple trees, *Acer saccharum* Marsh., during March and April of 1950, 1951, 1952 and 1953 have been obtained from an automatic recording device. Wood, bark, twig and air temperatures were recorded simultaneously for the same trees. Preliminary study of the data showed that the flows were more closely related to twig temperatures than to the other temperatures recorded, and twig temperatures have been used in a multiple regression analysis. A significant portion of the daily flow can be accounted for by a multiple linear regression of flow rate on (1) the number of hours during the day preceding the flow, when twig temperature was below 0° C.; (2) the total volume of flow on the preceding day; (3) the number of degree-hours above a previous low, cumulated for the day of the flow; and (4) the serial number of the day of the flow. Of these, (1) is of most importance, indicating that preceding temperatures are more important than current temperatures in determining the amount of a flow. The fact that flows characteristically begin after a rapid temperature rise above freezing suggests a "triggering" effect of temperature. [Authors' summary.]—Vt agric. Exp. Stat.

3930. CLEMENTS, R. L.
A study of seasonal changes in the composition of maple sap and syrup, with special reference to the anazotic and amino acids.
Diss. Abstr., 1956, **16**: 642, being *Publ.* 16063 of 86 pp.

Sap was collected from 2 specimens of *Acer saccharum* over a period of 60 days. Total solids ranged from 1·8 to 3·1%. Amino nitrogen content increased during the period studied, the greatest increase occurring during the last 10 days. Paper chromatography of a pooled number of saps showed the presence of succinic, fumaric, malic and citric acids. Malic acid predominated in all saps. Paper chromatography of the amino acids indicated traces of aspartic and glutamic acids, valine and the leucines in early-season sap. Late-season sap contained large amounts of glutamine, and increased amounts of valine and the leucines. A new procedure for the quantitative determination of ultra-micro quantities of amino acids is described.

3931. Caroselli, N. E.
The effect of various soil amendments on maple wilt incited by *Verticillium* sp.
From abstr. in *Phytopathology*, 1956, **46**: 240.

With the exception of sodium nitrate, nitrogenous fertilizers applied to the soil surface 1 or 9 months before inoculating young sugar maples with wilt all gave some degree of control.

Tannin plants.

(*See also* 3939h, l.)

3932. Webb, D. v. V., and Ripley, L. B.
Aerial spraying against wattle bagworm.
Fmg S. Afr., 1956, **31**: 220-1.

Random mortality surveys of the third large-scale aerial spraying campaign, using a 10% toxaphene-diesoline spray at 3 gal. per acre, against the wattle bagworm [*Acanthopsyche junodi*] confirmed the satisfactory results obtained in the two previous campaigns [see *H.A.*, 25: 1882]. Details of technique and the part played by the white fungus, *Isaria psychadae*, in the control of the pest are also discussed.—Coll. Agric., Cedara, Natal.

Sundry plants.

(*See also* 3855o, 3939b, o, z, 3940b, 4267.)

3933. García Guillinta, M. J.
Estudio químico del achiote (*Bixa orellana*). **(Chemical study of annatto (*Bixa orellana*).)**
Inf. mens. Estac. exp. agríc. La Molina, 1956, 30(342): 34-9, bibl. 6.

Botanical features, propagation and production are briefly discussed. Extraction and chemical characteristics of the colouring matter bixine are described.

3934. Gómez Zuluaga, M.
Biología y represión del *Dinoderus minutus* Fabricius en los géneros *Guadua* y *Bambusa*. **(Biology and control of *Dinoderus minutus* on the genera *Guadua* and *Bambusa*.)** [English summary 1¼ p.]
Acta agron. Palmira, 1955, **5**: 193-210, bibl. 35, illus.

Bambusa vulgaris var. *vittata* was highly susceptible, especially at the internodes, to attacks of the powder-post beetle (*Dinoderus minutus*). An unnamed species of *Bambusa* was attacked mainly at the nodes. *Guadua angustifolia* was much more resistant than either *Bambusa* sp., showing no definite zone of attack. In a field experiment, treatment of portions of the stem with 5% DDT, 40% chordane, 15% Dieldrex or Multanin (84·5% DDT plus 5·5% BHC γ isomer), all in kerosene, gave rapid control of the pest and protection for three months. Application by immersion was more effective than that by brushing.

3935. Kennard, W. C.
Flowering of the bamboo *Guadua amplexifolia* Presl. in Puerto Rico.
Lloydia, 1955, **18**: 193-6, bibl. 7, illus.

Bamboo plants originally propagated in 1938 flowered in November 1953 and April 1954. Neither age nor location appeared to affect flowering. Both fruit set and seedling germination were very low.

3936. Hodge, W. H., and Sineath, H. H.
The Mexican candelilla plant and its wax.
Econ. Bot., 1956, **10**: 134-54, illus.

The plants supplying the wax are chiefly *Euphorbia* species growing in arid conditions, the most important of which is *E. antisyphilitica*. All candelilla wax is obtained from wild plants mostly during the October to June dry period. Wax extraction is described and its properties given.—Agric. Res. Serv., U.S.D.A., Beltsville, Md, and Ga Inst. Technol., Atlanta.

3937. Bond, G., MacConnell, J. T., and McCallum, A. H.
The nitrogen-nutrition of *Hippophaë rhamnoides* L.
Ann. Bot. Lond., 1956, **20**: 501-12, bibl. 12.

Hippophaë in its nitrogen nutrition is found to show a close similarity to the nodulated leguminous plants. It is pointed out that *Hippophaë* and the other angiospermous genera with nitrogen-fixing nodules are all woody plants or belong to a family which includes woody plants. Hence the authors consider that this makes it likely that the character is of an ancient origin dating from a time when only woody flowering plants existed.

3938. da Paixão-Correia, C. A.
Sobre a formação de gomos florais adventícios em estacas de *Quercus suber* L. tratadas com os ácidos 1-naftalenoacético e indol-3-acético. **(The formation of adventitious flower buds on cuttings of *Quercus suber* treated with 1-naphthaleneacetic acid and indole-3-acetic acid.)** [English summary 1 p.]
Portugal. Acta biol., 1955, 4: 249-63, bibl. 41, illus.

Cuttings were taken from 2- to 3-year-old cork oak branches or 1-year-old suckers, which had previously been treated with NAA or IAA at 0·25, 0·5 or 1% in lanolin applied to incisions or rings cut in the wood. The cuttings were kept in tap water for observation. Only the lowest concentration of the hormones produced any effect. This induced the formation of male flower catkins arranged in a rosette. The amount of callus formation was in direct proportion, and the amount of root production in inverse proportion, to the amount of flower production.—Cork-Forestry Exp. Stat., Alcobaça.

Noted.

3939.

a Abraham, P.
Heard of vanilla?
Indian Fmg, 1956, 6(2): 15-18, illus.
Culture and curing in India.

b Amin, E. S.
The mucilages of *Hibiscus esculentus* (okra or bamia fellahi) **and *Corchorus olitorius*** (mulukhia).
J. chem. Soc. Lond., April 1956, pp. 828-32, bibl. 11.
Composition.

c Baltazar, E. P.
The future of ramie in the Philippines.
Philipp. J. Agric., 1954 (issued 1955), **19**: 1-17, illus.
Outlook considered promising.

d Brown, N. C., Phipers, R. F., and Wood, M. C.
The analysis of pyrethrins. Part II. A "sulphur-colour" test.
Pyreth. Post, 1956, 4(1): 24-9, bibl. several in text.

e Brown, N. C., and others.
The analysis of pyrethrins. Part III. A correlation of various analytical methods with bioassays.
Pyreth. Post, 1956, 4(1): 30-2, bibl. several in text.

f Chandler, S. E.
Botanical aspects of pyrethrum. III. The natural history of the secretory organs; the pyrethrins content of the fertile achenes ("seed").
Pyreth. Post, 1956, 4(1): 10-15, bibl. 6, illus.
Changes in secretory organs of the achenes during development.

g Coomber, H. E.
Pyrethrum analysis and methods.
Pyreth. Post, 1956, 4(1): 20-4, bibl. 10.
A survey of investigations in the U.K. since 1948.

h Elmer, J. L., and Smith, R. G.
Some pests of black wattle in Kenya, with a list of other insects inhabiting the plantations.
E. Afr. agric. J., 1956, **21**: 230-47, bibl. 9, illus.
With notes on control.

i Gazzo, J., and Corbera V., J.
Estudios de las correlaciones entre el diámetro, los porcentajes en rotenona y extracto clorofórmico total en raíces de cube, *Lonchocarpus utilis*. Su aplicación en el muestreo. **(Studies of the correlations between the diameter, the percentage of rotenone and the percentage of total chloroform extract in the roots of *Lonchocarpus utilis*. Their application in sampling.)**
Agronomía, Peru, 1954, **19**(78): 52-60, from abstr. in *Supl. bibl. Turrialba*, 1955, **5**: 41.
Including notes on cultivation, pests and diseases.

j Glenn, R.
Maori medicinal plants. Species which were highly esteemed.
N.Z. Gdnr, 1956, **12**: 704-6, illus.

k Gupta, D. K., and Iyenger, B. T. R.
Seed fat from *Caesalpinia digyna*.
Sci. and Cult., 1956, **21**: 682-3, bibl. 2.
The content of higher saturated acids appears to be negligible.

l Hathway, D. E.
Amino acids, fruit acids and polypols of myrobalans.
Biochem. J., 1956, **63**: 380-7, bibl. 55.
In dried fruits of *Terminalia chebula*, used for tanning.

m Isenberg, I. H.
Papermaking fibers.
Econ. Bot., 1956, **10**: 176-93, bibl. 12.
A brief review of the species used.

n Kelsey, D.
Report on pyrethrins.
J. Ass. off. agric. Chem. Wash., 1956, **39**: 377-9, bibl. 6.
Further investigation of analytical methods recommended.

o Khan, A. R., and Yaqub, M.
Turmeric (haldi) cultivation in the Punjab.
Agric. Pakistan, 1955, **6**: 50-1.
Suggestions for growing *Curcuma longa* based on promising results of 3 years' trials.

p Laumont, —., and Piquemal, —.
Conseils pratiques sur la culture du ricin en Algérie. **(Practical hints on growing castor beans in Algeria.)**
Reprinted from *Bull. Renseign. agric.*, 1956, No. 25, pp. 3.
As annuals and perennials.

q Mihlin, D. M., and Ahunbaeva, B. O.
Fructosans of kok-saghyz roots. [Russian, with English summary 12 lines.]
Biohimija, 1956, **21**: 186-90, bibl. 10, illus.
During growth and dormancy.

r Monachino, J. (Yu, H.).
Chinese herbal medicine—recent studies.
Econ. Bot., 1956, **10**: 42-8.
Notes on the uses to which many plants are put, from a paper by H. Yu.

s Monachino, J.
The sarmentogeniferous variety of *Strophanthus sarmentosus*.
Bull. Torrey bot. Club, 1956, **83**: 281-8, bibl. 22.
S. sarmentosus var. *senegambiae*.

t Núñez Meléndez, E.
The pharmacognosy and pharmacology of *Kleinia aizoides* DC.
Diss. Abstr., 1956, **16**: 641, being *Publ.* 12788 of 104 pp.
A succulent plant used in Puerto Rico to arrest bleeding.

u van Os, F. H. L.
Le dosage chimique des glycosides dans les feuilles de digitale. (V). Une comparaison entre les méthodes de Wegner, de Langejan-van Pinxteren et de Tattje-van Os. **(The chemical determination of the glycosides in *Digitalis* leaves. V. A comparison between the methods of Wegner, Langejan-van Pinxteren and Tattje-van Os.)** [English summary ¾ p.]
Maveg., 1956, **2**: 43-52, bibl. 16.

v Pontovič, V. E.
The activity of oxidising enzymes and the synthesis of reduced compounds. [Russian.]
Trud. Inst. Fiziol. Rast. Timiryazeva, 1955, **9**: 242-53, bibl. 24.
In dandelions, kok-saghyz and krym-saghyz.

w Pšenova, K. V.
The oxidases of essential oil plants. [Russian, with English summary 10 lines.]
Biohimija, 1956, **21**: 279-87, bibl. 12.
Coriander and mint.

x Quayle, J. R.
Paper chromatography of pyrethrins and their derivatives.
Nature, 1956, **178**: 375-6, bibl. 9, illus.

y Singh, D.
The ramie in Florida.
Indian Fmg, 1956, **6**(1): 27-9, illus.

z Thieret, J. W.
Bryophytes as economic plants.
Econ. Bot., 1956, **10**: 75-91, bibl. 106.
The many ways in which mosses and liverworts are used.

3940.
a Walker, A. L.
Peppermint oil production in south central Washington, 1953.
Stats Circ. Wash. St. agric. Exp. Stats **253**, 1954, pp. 15.
Acreages, yields and production costs based on 28 farms.

b Wall, M. E., and others.
Steroidal sapogenins, XXVI. Supplementary table of data for steroidal sapogenins, XXV.
[*Publ.*] *U.S. Dep. Agric.* **ARS-73-4,** 1955, pp. 30.
Sapogenin contents tabulated for a further 1,000 species.

c Willaman, J. J., and Schubert, B. G.
Alkaloid hunting—a supplemental table of genera.
[*Publ.*] *U.S. Dep. Agric.* **ARS-73-1,** 1955, pp. 18.
A supplement to the article abstracted in *H.A.*, 25: 4130.

d Wills, E. D.
Enzyme inhibition by allicin, the active principle of garlic.
Biochem. J., 1956, **63**: 514-20, bibl. 30.
Showing allicin, and not alliin, to be active medicinally.

FLORICULTURE.

General.

(*See also* 3235, 3244, 3281, 3339, 3516, 3596, 3638-3643, 4030b, c, f, l, q, r, u, v, 4031c, d, h, q, 4265, 4275.)

3941. Anon.
The landscape treatment of roads.
The Council for the Preservation of Rural England, 4 Hobart Place, London, S.W.1, 1954, pp. 27.

Those who want more and better roads in any country could not do better than examine the commonsense contents of this pamphlet. Very briefly, problems are considered under the following heads: the road in the landscape, overall widths, carriageways, treatment of central strip and verges, cuttings and embankments, stopping places, avenues and vistas.

3942. Lunt, H. A., Nelson, P. K., and others.
Soil.
Brooklyn bot. Gdn Rec., 1956, **12**: 1-79, illus.

The policy adopted by this journal in recent years of devoting a whole number to one subject or group of related subjects has been continued. On this occasion the subject is garden soils and the many ways of maintaining and improving their fertility. Some 16 authors, many of whom are well known in the realms of soil science, contribute articles on such aspects as the use of lime and fertilizers (including the new slow-acting nitrogen compounds based on urea-formaldehyde), methods of cultivation, soil testing and composting, and earthworms, soil micro-organisms, soil sterilization, and soil conditioners.

3943. Boskoop (Dorsman, C.).
Jaarboek Proefstation voor de Boomkwekerij te Boskoop 1955. **(Yearbook of the Boskoop Tree and Shrub Nursery Experimental Station for 1955),** pp. 192, illus.

Accounts are given of studies on propagation, soils and manures, plant protection, breeding, weed control and chemical defoliation in woody ornamentals. [See also separate abstracts.]

3944. Garthwaite, J. M.
Flower section.
A.R. Luddington exp. Hort. Stat. 1955, 1956, pp. 61-8.

Work reported includes: *Dahlias:* maintenance of virus-free stocks; methods of propagation. *Gerberas:* nutrition; observations on strains. *Chrysanthemums:* propagation and culture of early flowering varieties; *C. maximum* variety trial. *Miscellaneous trials and studies* on polyanthus, wallflowers, and *Lilium regale*.

3945. Miranda de Onís, J., and Bernaldo de Quirós, A. G.
Registro de variedades de plantas ornamentales. **(Register of varieties of ornamental plants.)**
An. Inst. nac. Invest. agron. Madrid, 1955, **4**: 531-63, illus.

As part of a scheme started by the National Institute of Agronomic Research, Madrid, to compile a register of varieties of cultivated plants [see abstract No. 3236], work has been started on ornamental plants. In the present paper the scope and problems of the work are discussed, with special reference to roses. A list is given of some 400 rose varieties, which have been grown in the Central Rose Collection, Madrid, and adequately identified, giving name, in some cases synonyms, raiser and date of introduction.

3946. American Phytopathological Society, Ornamental Crops Subcommittee.
Development and production of pathogen-free propagative material of ornamental plants.
Plant Dis. Reptr Suppl. **238,** 1956, pp. 57-95.

This supplement should be valuable to nurserymen concerned with the propagation of the plants dealt with here and to those who advise them. In it are presented selected examples of the successful production of pathogen-free plant material, giving the following information in each case: Methods of detecting infection; methods of getting pathogen-free original stock; methods of maintaining the pathogen-free status under conditions of commercial propagation; and degree of economic success obtained. Named experts in different places are responsible for the different articles. The plants and the pathogens concerned are: Chrysanthemums from virus and other pathogens; stocks from bacterial blight; zinnias from *Alternaria*; nasturtium from *Heterosporium*; carnations from virus and other pathogens; gladiolus corms from various diseases; roses from black spot and *Verticillium*; geranium from various pathogens; and various foliage and succulent plants from a number of disease organisms.

3947. Clum, F. M.
The effect of seed treatment on control of damping-off of ornamentals; and a study of a new fungal pathogen causing damping-off.
Diss. Abstr., 1956, **16**: 437, being *Publ.* 15754 of 100 pp.

Protective fungicidal coatings applied to seeds of aster, bachelor's button, calendula, cosmos, four o'clock [*Mirabilis jalapa*], nasturtium, phlox, morning glory [*Ipomea* sp.], stock, sweet pea and zinnia resulted in improved seedling emergence. Seed protectants were of no benefit to marigold, and only limited protection was apparent with larkspur and dahlia. Post-emergence damping-off was not controlled by seed protectants in these experiments. A new organism, *Pycnidiophora dispersa*, was isolated from a diseased phlox seedling.

3948. Domsch, K. H.
Beitrag zur Beizmittelprüfung an Samen von Zierpflanzen. **(Report on testing of seed disinfectants on seeds of ornamentals.)**
NachrBl. dtsch. PflSchDienst., Braunschweig, 1956, **8**: 69-72, bibl. 13.

The effect of seed treatments on healthy seeds and seed parasites was evaluated under different conditions, using chiefly *Callistephus chinensis* and Ceresan plus 20% BHC. When the seeds were subsequently sown in soil applications up to 10g./kg. did not cause injury.

3949. Carra, P.
Recherche des meilleurs supports de bouturage. **(Research on the best media for cuttings.)**
Rev. hort. Algér., 1956, **60**: 47-53.

Four rooting media were tested in a trial with 51 ornamental plant species. Vermiculite, peat, grey river-bed sand and leaf mould were used at first, but the last soon proved unsatisfactory and was replaced by fine sand. Rooting was very variable, depending on species and time of propagation. Results are tabulated, and the species for which each medium proved best are listed.

3950. Dorsman, C., and Ravensberg, K.
Stekken onder waternevel. **(Mist propagation of cuttings.)**
Jaarb. Proefst. Boomkw. Boskoop 1955, pp. 27-42, illus.

Results from 2 years' experiments are summarized. Mist propagation in a glasshouse generally gave better results than ordinary propagation under double glass. The differences with azaleas were not very marked but rhododendrons and conifers rooted much better under mist. Rainwater gave the best results especially with ericaceous plants. An interrupted mist regime was more satisfactory than constant mist.

3951. Vanderbrook, C.
The storage of rooted cuttings.
Amer. Nurserym., 1956, **103**(9): 10, 76-7.

At Cornell University, rooted cuttings of *Teucrium chamaedrys* were satisfactorily stored bare-root in closed polyethylene bags for 167 days at 34° F.; storage at 31° F. was unsatisfactory. Rooted cuttings of *Taxus cuspidata*, *Juniperus communis hibernica*, *Thuja occidentalis pyramidalis* and *T. occidentalis globosa* were also stored successfully for 139 days at 39° F. In commercial-scale tests rooted cuttings of *Teucrium chamaedrys* in polyethylene bags stored best at 34–36° F., when the storage period was 60 days.

3952. Barker, P. A.
Research with container-grown stock.
Amer. Nurserym., 1956, **104**(1): 108-10, 161.

An account is given of work carried out since 1950 at the Ohio State University, Columbus, on growing nursery stock of woody ornamentals in metal containers. Crushed limestone proved the best material for surfacing the standing ground; plants stood on wood shavings or sand developed heavy root systems through the drainage holes of the containers. Plants grown in containers for 1 year were bigger than plants of similar age grown in the field, but when plants were kept in containers for a second year growth was generally poor. In winter protection tests the use of baled straw walls round the plots, with or without laths over the top, only reduced temperature fluctuations in the soil in the containers during sunny weather, whereas a mulch of wood shavings or corn cobs deep enough to cover the containers but not the plants increased soil temperatures and resulted in greater growth than protection by straw walls or no protection.

3953. Kofranek, A. M., and Kohl, H. C.
Plastic greenhouses prove successful for California carnation, mum growers.
Flor. Exch., 1956, **126**(3): 15, 17.

Plastic greenhouses have recently become extremely popular for growing carnations and also chrysanthemums in California. The initial construction cost per square foot is generally $\frac{1}{16}$th to $\frac{1}{10}$th that of conventional houses. In the summer a plastic house can be converted to a cloth house so that cool crops such as carnations may be grown. Details of construction are given.—Univ. Calif., Los Angeles.

3954. Schupp, F.
Erfahrungen mit dem Anstauverfahren bei Topfpflanzen. **(Experience with the flooding method in pot plant growing.)**
Gartenwelt, 1956, **56**: 217-18, illus.

Practical details are given of a labour-saving method of growing pot plants. The pots are plunged in gravel in troughs, 15 m.×1·25 m.×10 to 12 cm. deep and sloping gently to a drainage hole at one end, and are flooded periodically with a nutrient solution. Species that have been grown successfully in this way include begonias, calceolarias, cyclamen, gloxinias, hydrangeas and primulas as well as various foliage plants.—Lehr-u. Versuchsanst. Gartenb., Heidelberg.

3955. Zieger, F.
Pflanzenkulturen in Thermalwasser. **(Cultivating plants with the help of hot spring water.)**
Mitt. Klosterneuburg Ser. B, 1956, **6**: 116-18.

An account is given of the successful raising of *Victoria regia*, *Eichhornia crassipes*, *Pistia stratiotes* and *Cyperus* spp. in containers packed in hot beds and supplied with warm water from the natural hot springs of Baden, near Vienna.

3956. Bing, A.
The use of urea-formaldehyde nitrogen on greenhouse crops.
Bull. N.Y. St. Flower Grs, 1956, No. 127, pp. 2-4, bibl. 1, illus.

As in previous trials with several crops [*H.A.*, 26: 1966] poinsettias responded better to an application of ½ teaspoonful Uramite per 4-in. pot than to smaller or larger dressings. Four chrysanthemum varieties varied considerably in their response, but in most cases they were affected adversely, especially when urea-formaldehyde was applied to the soil before steaming and at rates of 1 and 2 teaspoonsful per 4-in. pot. The costs of this and other sources of N are compared.—Ornamentals Res. Lab., Farmingdale, L.I., N.Y.

3957. Pettersson, F. A. S.
Några exempel på kloratforgiftning i växthus. **(Some examples of chlorate poisoning in the glasshouse.)**
Växtskyddsnotiser, 1956, No. 1/2, pp. 8-10, illus.

Typical symptoms of chlorate injury to plants are briefly described. Among glasshouse crops primula and cineraria appear to be particularly sensitive to chlorate, which may be toxic at a concentration as low as 0·001%. Weed control by sodium chlorate near glasshouses is deprecated. [See also *H.A.*, 18: 1587.]

3958. Susini, E.
Prime osservazioni sui danni provocati dal gelo a piante ornamentali di pien'aria a Firenze. **(Preliminary observations on the damage caused by frost to outdoor ornamental plants at Florence.)**
Riv. Ortoflorofruttic. ital., 1956, **40**: 177-80.

Maxima and minima are recorded for temperatures 0·5, 0·75 and 1 m. below the soil surface and for air temperatures during February 1956. Lists are given of herbaceous and woody plants showing different degrees of damage and resistance, and of late-leafing species showing no apparent effects. A further report on possible delayed reactions is to be published.—Ist. tec. agrar. spec. Firenze.

3959. Müller, H. W. K.
Zum Auftreten und zur Bekämpfung von Milben (Tarsonemiden) an gärtnerischen Pflanzen. **(The occurrence and control of mites (tarsonemids) on horticultural plants.)**
NachrBl. dtsch. PflSchDienst., Braunschweig, 1956, **8**: 98-102, bibl. 14, illus.

Symptoms caused by *Tarsonemus pallidus* and *Hemitarsonemus latus* on several decorative plants are described. Endrin emulsion at double strength gave the best results when applied at least twice [see also *H.A.*, 26: 2963]. Parathion at high concentrations cannot always be recommended owing to its phytotoxicity. Young plants and those possibly infested should be kept under conditions of low humidity and wide spacing.—Staatsinst. angew. Bot., Hamburg.

3960. Tinga, J. H.
The effect of modified atmosphere storage at low temperature and treatments after low temperature storage which affect the keeping quality of cut flowers.
Diss. Abstr., 1956, **16**: 623, being *Publ.* 16264 of 204 pp.

Roses, snapdragons, chrysanthemums, carnations and orchids were stored in ordinary air, air enriched with up to 15% CO_2, and air modified by decreasing the oxygen down to 5% with nitrogen gas at temperatures of 31°, 36°, 40° and 50° F. Slight modifications of the atmosphere did not increase the life of cut flowers. With greater alterations in composition of the atmosphere petal drying, pedicel necrosis and colour changes resulted. Storage in ordinary air in a high humidity container at 31° F. was the most satisfactory treatment for all flowers, except orchids which kept best at 50° F. The use of a weak detergent solution was helpful in promoting the recovery of wilted flowers. Several solutions containing a bactericide and sugar were useful in extending the life of cut flowers, especially roses. Sodium azide and other respiratory inhibitors increased the useful life of carnations slightly.

Annual and herbaceous plants.

(*See also* 3236, 3802, 4030d, e, j, m, o, x, 4031c, o, r, s, 4132.)

3961. Gasiorkiewicz, E. C.
Effects of antibiotic dip treatments on carnations.
Plant Dis. Reptr, 1956, **40**: 421-3, bibl. 3.

Terramycin and Streptomycin S dips induced phytotoxic effects in carnation cuttings. The symptoms were failure of callus tissue formation and poor rooting. —Mass. Coll. Agric. Exp. Stat., Amherst.

3962. Glasscock, H. H.
Testing for the carnation wilts.
J. roy. hort. Soc., 1956, **81**: 313-16, bibl. 5, illus.

A method, developed in the U.S.A. and slightly modified, is described for testing cuttings which may be infected with *Verticillium cinerescens* or *Fusarium dianthi*. The method is suitable for use in nurseries.—N.A.A.S., Wye.

3963. JACKS, H.
A note on control of clover mite (*Braeobia praetiosa* Koch) on *Dianthus chinensis* L.
N.Z. J. Sci. Tech., Sect. A, 1956, **37**: 523-5, bibl. 1.

Twelve acaricides were tested for the control of clover mites on *Dianthus chinensis*. Effective control by contact action was obtained with materials based on butylphenoxy isopropyl chloroethyl sulphite, TEPP, malathion and parathion. Satisfactory control by residual action was given by chlorbenzide. Effective contact and residual control was obtained by materials based on petroleum oil, demeton and dimefox.—D.S.I.R., Auckland.

3964. CROSSLEY, J. H., WEBSTER, G. R., AND WOODS, J. J.
Results of experiments with chrysanthemums at Saanichton, B.C.
Mimeo. Saanichton Domin. exp. Farm **160**, 1956, pp. 8, illus.

Several cultural experiments for outdoor chrysanthemums were started in 1955. Planting in the first week in June followed by shading from about the first week in July gave the best results with 9- and 10-week varieties. Nylon and fibreen were equally effective as shading materials. Softer stems (desirable for better lasting quality) were not produced under saran screens. A polyethylene roof gave satisfactory rain protection. The best varieties grown are listed.

3965. FURUTA, T., AND KIPLINGER, D. C.
Chronological age of cuttings, a factor influencing the spray formation of pompom chrysanthemums.
Proc. Amer. Soc. hort. Sci., 1955, **66**: 383-5.

When tip cuttings of Soprano pompom chrysanthemums were taken from shoots of different ages and the resultant plants were not pinched, the height of the crown bud varied with the age of the shoot, the older the shoot the lower the crown bud. On similar plants that were pinched there was no correlation between the height of the crown bud and the age of the parent shoot. It is concluded that variations in flower spray formation on unpinched pompoms can be caused by using shoots of various ages as a source of cuttings.—Ohio agric. Exp. Stat., Wooster.

3966. CATHEY, H. M.
Chrysanthemum temperature study. D. Effect of temperature shifts upon the spray formation and flowering time of *Chrysanthemum morifolium*.
Proc. Amer. Soc. hort. Sci., 1955, **66**: 386-91, bibl. 4, illus.

Stock plants of the thermopositive variety Satellite and the thermonegative variety Revelation were kept at a minimum night temperature of 60°, 70° or 80° F. Cuttings from these plants were transferred to a minimum night temperature of 50° or 60° F. at various stages of development. The type of spray produced could be controlled by the amount and time of temperature reduction. Reduction of temperature from 80° to 60° F. at the start of long nights or when buds were just visible produced crowned sprays with elongated terminal sprays. Reduction of temperature from 80° to 50° F. produced crowned sprays with elongated peduncles. The later the change occurred the greater the elongation of the lateral shoots. Flowering could be either accelerated or delayed by reduction in temperature, depending on the variety and the amount and time of the reduction.—Cornell Univ., Ithaca, N.Y. [For earlier papers in this series, see *H.A.*, 25: 4188-4190.]

3967. PRAMER, D., ROBISON, R. S., AND STARKEY, R. L.
The mode of action of antibiotics in the control of plant disease.
Phytopathology, 1956, **46**: 341-2, bibl. 9.

Various possible modes of action are discussed. Experiments showed that control of bacterial wilt (*Erwinia chrysanthemi*) of chrysanthemums by streptomycin results from direct action of the antibiotic on the pathogen.—N.J. agric. Exp. Stat., New Brunswick.

3968. v. ROSEN, A. S. H.
Ett bekämpningsförsök mot krysantemumfluga under vintern. **(An experiment on chrysanthemum fly control in winter.)**
Växtskyddsnotiser, 1956, No. 1/2, pp. 28-30, illus.

Malathion, which had given good control of chrysanthemum fly in summer, proved ineffective in winter, but two systemic insecticides and a lindane preparation gave satisfactory results at a glasshouse temperature of 13·5° C. Two applications of the latter, as the less toxic, are recommended.

3969. NJOKU, E.
Studies in the morphogenesis of leaves. XI. The effect of light intensity on leaf shape in *Ipomea caerulea*.
New Phytol., 1956, **55**: 91-110, bibl. 19, illus.

Observations are recorded of the changes in leaf shape from node to node in plants of *Ipomea caerulea* grown under varying intensities of light. These observations show that the amount of leaf lobing decreases with decreasing light intensity and lobing is completely suppressed in 0·23 daylight and lower intensities. Plants already producing lobed leaves in full daylight revert to the production of entire leaves when transferred to deep shade, and shade plants producing entire leaves soon begin to produce lobed leaves on transfer to full daylight. There is no correlation between the changes in leaf shape and changes in leaf area, cell size and cell number. The shape of the leaf is determined early in ontogeny and is not appreciably altered during the later growth of the leaf. The experimental results are discussed with reference to current views on the factors controlling heteroblastic development, and it is concluded that more work is required before the effect of light intensity on leaf shape can be definitely referred to factors as specific as carbohydrate nutrition or auxin supply. [From author's summary.]—Univ. Coll., Ibadan, Nigeria.

3970. HG.
Warum sind erfahrungsgemäss *Primula obconica* und *Primula sinensis* in der Gärtnerei weniger giftig als beim Privatkunden? **(Why are *Primula obconica* and *P. sinensis* less poisonous in the nursery than in a private house?)**
Schweiz. Gärtnerztg., 1956, **59**(16): 2-3, bibl. 4, illus.

The effect of temperature and humidity on the number of leaf hairs of primulas and their toxin content is discussed. Toxicity is much lower in the humid conditions of the nursery than in the dry atmosphere of a centrally heated private house.

3971. HANCHEY, R. H.
Effects of fluorescent and natural light on vegetative and reproductive growth in *Saintpaulia.*
Proc. Amer. Soc. hort. Sci., 1955, **66**: 378-82, bibl. 10.

Experiments showed that excellent plants of good quality could be produced under fluorescent light. The greatest number of flowers and the earliest flowering were obtained with 600 f.c. of fluorescent light applied for 18 hours a day. An intensity of 100 f.c. of fluorescent light for 6, 12 or 18 hours daily was not sufficient for satisfactory flower initiation or development, although the 2 longer photoperiods were ample for vegetative growth. In general plants made greater vegetative growth under fluorescent than under natural light, and the former was more effective in inducing the production of 2 inflorescences in a single leaf axil.—La St. Univ., Baton Rouge.

3972. KRISTOFFERSEN, T.
Forsøk med kunstig lys til prydløvemunn, *Antirrhinum majus* L. **(Experiments on the use of artificial light for snapdragon.)**
Gartneryrket, 1956, **46**: 378-80, 382, 384-5, 387, bibl. 8, illus.

The 9 varieties of snapdragon tested grew well in artificial light (from germination to planting out), but the benefit was not striking. Where illumination is contemplated, strip lighting at the rate of 150 watts/sq. m. should be applied in conjunction with a temperature of 12°–13° C.

3973. MYER, F. W.
Snapdragon wilts.
Flor. Exch., 1956, **126**(25): 10.

Soil applications of oxyquinoline sulphate solution, 1: 400, have given excellent control of *Rhizoctonia solani* on snapdragons.—Conn. agric. Exp. Stat., New Haven.

3974. MILLER, R.
Water and soil temperatures on stocks.
Bull. N.Y. St. Flower Grs, 1956, No. 125, pp. 1-3, bibl. 2.

Stocks, *Matthiola incana*, were grown at 2 air temperatures (40° and 50° F.) and 4 soil temperatures (40°, 50°, 60° and 70° F.). Treatments were started early in February when the plants were about 6 weeks old. High soil temperatures increased early growth and advanced flowering by a few days, but produced a deficiency of soil nutrients, especially K, which adversely affected the size and quality of mature plants. Water at 4 different temperatures was also applied as required to a similar batch of plants, but neither growth nor flowering date was affected.—Cornell Univ.

3975. JUNGES, W.
Beeinflussung der Entwicklung und des Ertrages von Edelwicken [*Lathyrus odoratus* L.] durch Jarowisation und Photoperiodik. **(The effect of vernalization and photoperiodism on the development and yield of sweet peas.)**
Arch. Gartenb., 1955, **3**: 297-315, bibl. 20, illus.

When sweet peas were grown under glass in the winter photoperiod had a greater effect on start of flowering and total flower number than did vernalization. In long days (14–18 hours) flowering started 4–5 weeks earlier than in short days (8–11½ hours). Plants grown in short days had shorter internodes and more foliage, and produced more inflorescences and flowers, than did plants grown in long days. Vernalization at +3° C. for 7 days had an inhibitory effect on subsequent growth and development, but vernalization for 14 days and longer had no such effect. It is suggested that the sweet pea, which is indigenous to Sicily, may respond to a higher vernalization temperature. The optimum period of vernalization for early flower production was dependent on the photoperiod applied while the plants were vegetative; the optimum vernalization period was 6 weeks when followed by long days and only 2 weeks when followed by short days. The most favourable vernalization period with regard to yield was 4 weeks before long days. Flower number per inflorescence and stem length increased during the flowering period to a maximum and then decreased. Final yields were lower in long days than in short days.—Inst. Gartenb., Dresden-Pillnitz.

3976. ENDŌ, T.
Biochemical and genetical investigations of flower color in *Viola tricolor* L. I. Inter-relationships of pigment constituents occurring in ten varieties.
Jap. J. Bot., 1954, **14**: 187-93, bibl. 12.

The pigments contained in the petals of 10 varieties of *V. tricolor* were analysed by means of paper chromatography, and it was found that 2 flavones, 5 anthocyanins and 5 carotenoids were involved in the flower colour variation of these varieties. Various pigment constituents varying in proportions and intensities were found to be responsible for the characteristic colouring of the 10 varieties. It appears that pigments of the same kind tend to occur in groups. [From author's summary.]—Nat. Inst. Genet., Misima.

Bulbs, tubers, etc.

(*See also* 3633-3637, 4030n, p, y, 4031p, t, u.)

3977. MAATSCH, R., AND HASSENKAMP, R.
Schnittblumenerträge bei Cyclamen. II. **(Cut flower yields from cyclamen. II.)**
Gartenwelt, 1956, **56**: 168-9.

Yield records of cut flowers from cyclamen were continued for a second season [for an earlier report, see *H.A.*, 26: 908]. Higher yields were obtained from

2 dark red strains than from white-flowered strains. Total yields of the former varied between 5 and 10 flowers per plant. No short-stemmed flowers were produced before mid-January.—Inst. Zierpflanzenb., Techn. Hochsch., Hannover.

3978. Stahl, M.
Cylindrocarpon radicicola als Krankheitserreger bei Cyclamen. (***Cylindrocarpon radicicola* causing disease in cyclamen.**)
NachrBl. dtsch. PflSchDienst., Braunschweig, 1956, **8**: 102-5, bibl. 8, illus.

Symptoms caused by the soil-borne fungus *Cylindrocarpon radicicola* on cyclamen are described. Chemical soil sterilization would appear to be the most promising method of control.—Landesanst. für Pflanzenschutz, Stuttgart.

3979. Bald, J. G., Ferguson, J., and Markley, B. B.
Treatment of gladiolus cormels.
Calif. Agric., 1956, **10**(6): 15-16, illus.

A hot-water treatment of gladiolus cormels was tested as a means of obtaining fungus-disease-free planting stock [see also *H.A.*, 26: 2998 and 2999]. After digging the cormels were stored for 2 months at 95° F. After a preliminary soaking in water for 2 days they were soaked in a formaldehyde solution for 4 hours. They were next put in a hot-water bath at 135° F. for 30 minutes, and then cooled and dried. Percentage sprouting and vigour of most of the treated lots of cormels were increased by the hot-water treatment provided they were planted during the spring.

3980. Ghisleni, P. L.
Ricerche sulla reattività del gladiolo (gen. *Gladiolus* L.) all'illuminazione. (**Studies on responses of gladioli to illumination.**) [English summary 3 lines.]
Riv. Ortoflorofruttic. ital., 1956, **40**: 134-44, bibl. 20, illus.

The varieties Snow Princess (early), Sans Souci (late) and Aranjuez and Benares (intermediate) were exposed for 45 days after planting to a 3-hour illumination from sunset with 200 w., 500 w. or ultra-violet radiation. All treatments increased plant height and retarded flowering, results being most marked with 500 w. Average numbers of shoots per plant and flowers per spike were unaffected, but 200 w. and ultra-violet radiation tended to reduce the number of flowering shoots. Height response was greatest in Aranjuez and least in Sans Souci. Supplementary lighting changed the order of precocity so that Aranjuez and Benares flowered first and Snow Princess last. By the 40th day intolerance to ultra-violet radiation became evident.—Univ. Studi Torino.

3981. Stuart, N. W.
Some results of the 1955-56 cooperative iris forcing tests.
Proc. Bulb Grs' short Course 1956, Tacoma, Wash., pp. 34-7.

Tests have shown that among the best forcing varieties are Golden Nugget, Yellow Prince, Lemon Queen, Sunshine, White Perfection and Blue Ribbon.—U.S.D.A., Beltsville, Md.

3982. Van Laan, G. J.
Correlation of enzyme activity with the early flowering of cured, precooled bulbs of *Iris tingitana* (Wedgewood) used for forcing.
Proc. Amer. Soc. hort. Sci., 1955, **66**: 392-6, bibl. 10.

It was shown that curing at 90° F. increased dehydrogenase activity, decreased catalase activity and virtually stopped amylase activity in iris bulbs. Pre-cooling at 50° F. increased the activity of all 3 enzymes. No correlation existed between phosphorylase activity and bulb treatment.—Wash. St. agric. Exp. Stats, Pullman.

3983. Gould, C. J.
How to control blue mold in iris.
Proc. Bulb Grs' short Course 1955, Tacoma, Wash., pp. 6-7.

A dip of maneb plus aldrin was the best of the treatments tested with respect to early emergence, total yield, number of large bulbs and reduction in blue mould.—West. Wash. Exp. Stat., Puyallup.

3984. Randolph, L. F.
Nematodes and scorch in iris.
Gdn J. N.Y. bot. Gdn, 1956, **6**: 113, 120-1.

Infestation of iris rhizomes with *Meloidogyne incognita acrita* inhibited root growth but did not induce foliage symptoms similar to scorch under New York conditions. Diseased stock was cleaned by cutting off all the fibrous roots close to the rhizomes, which were then scrubbed and replanted under conditions favourable for new root growth.

3985. Kalin, E. W.
The influence of external treatments on the keeping qualities of cut daffodil flowers.
Proc. Bulb Grs' short Course 1955, Tacoma, Wash., pp. 19-20, bibl. 2.

Neither a plastic plant glaze at various concentrations nor maleic hydrazide at 0·03% were effective in prolonging the life of cut daffodil flowers held at room temperatures and about 20% R.H.—St. Coll. Wash., Pullman.

3986. Carlsson, G.
Testning av tulpanlökar. Ett försök att före planteringen undersöka lökarnas drivningsduglighet. (**Tulip bulb trials. Experiments to investigate the forcing capacity of bulbs before planting.**) [English summary 1¾ pp.]
Medd. Gullåk. VäxtförädlAnst. Hammenhög, 1956, No. 13, pp. 141-64, bibl. 6, illus.

Measurements were made of several commercial lots of tulip bulbs before forcing. A correlation found between forcing capacity and shoot and stamen length proved to be a fairly reliable guide to the forcing capacity of early varieties.

3987. Stuart, N. W.
Cooperative tulip forcing tests.
Proc. Bulb Grs' short Course 1956, Tacoma, Wash., pp. 38-40.

From the results of field and greenhouse tests it is concluded that, in general, pre-cooling bulbs at 40–45° F. produces earlier flowering and longer stems than storage at 50°.—U.S.D.A., Beltsville, Md.

3988. Anon.
Tulips stunted after heavy BHC dressings.
Grower, 1956, **45**: 1627.

Tulips showed stunted growth in plots which had received 5 applications of a 6·5% gamma-BHC dust during the previous spring. Weed growth was also checked.—Rosewarne exp. Hort. Stat.

3989. Bünemann, G., and Dewey, D. H.
Cold storage of cut tulips with and without water.
Quart. Bull. Mich. agric. Exp. Stat., 1956, **38**: 580-7, bibl. 9, illus.

Cut tulips were successfully stored at 31° F., either with the stems in water in the open, or without free water in an atmosphere of 11% CO_2 and 10% O_2. Dry storage in humid air of normal CO_2 and O_2 concentrations resulted in decay after 2 weeks. Concentrations of 16% CO_2 caused injury after 2 weeks' storage and higher concentrations caused injury sooner. Temperatures above 31° F. were unsuitable for storage periods exceeding 2 weeks. [For earlier work, see *H.A.*, 25: 2014.]

Lawns.

(*See also* 4030a, g, k, w.)

3990. Escritt, J. R.
Exfoliated vermiculite in turf production and maintenance.
J. Sports Turf Res. Inst., 1955, **9**: 90-3.

Exfoliated vermiculite, incorporated into the seed bed, gave temporary benefits in establishing turf from seed. As a top dressing for fine turf vermiculite tended to produce a soft surface and raised the pH of the soil.

3991. Davis, R. R.
The physical condition of putting-green soils and other environmental factors affecting the quality of greens.
Diss. Abstr., 1956, **16**: 425, being *Publ.* 14442 of 117 pp.

Putting greens selected by 8 greenkeepers as being relatively easy to maintain in good playing condition were classified as "best", while the most troublesome greens were classified as "poorest". Percolation rates for best greens tended to be faster than those for poorest greens; pore space was larger in best greens. The percent total pore space and organic matter content were higher in poorest greens. Best greens had a better root system and in general were more favourably located for good air circulation than poorest greens. Soil pH was higher and soil P and K contents were lower in the best greens than in the poorest greens.

3992. Drewitt, C. E., and James, E. B.
Liquid feeding of bowling greens.
Gdnrs' Chron., 1956, **139**: 686.

A fertilizer of stated composition was applied with success in irrigation water to bowling greens in constant use, 4 or 5 applications being given per year.

3993. Escritt, J. R.
Maleic hydrazide as a grass growth regulator.
J. Sports Turf Res. Inst., 1955, **9**: 76-84, bibl. 10, illus.

Applications of MH to sports turf reduced growth for some weeks but often damaged the common turf grass species. After the original inhibition treated plots showed a marked stimulation in growth. In coarse turf, 2 sprayings of 3–4 lb. MH made mowing unnecessary for the rest of the season. The application of 6 lb. MH per acre is considered the maximum safe dose, 3 to 4 lb. being generally the best rates. Weed growth was reduced to a lesser extent than grass growth. In certain trials a positive relationship between *Corticium* infection and MH treatment was observed.

3994. Smith, J. D.
Fungi and turf diseases. 5. Dollar spot disease.
J. Sports Turf Res. Inst., 1955, **9**: 35-59, bibl. 24, illus.

Dollar spot caused by *Sclerotinia homeocarpa* is common in sea-marsh fescue turf. Transmission appears to be by transport of infected leaf fragments on feet and implements. Fungicide trials were performed in 1954 and 1955 using materials containing calomel and corrosive sublimate, organo-mercury compounds, cadmium, TMTD and griseofulvin, most of which were effective in reducing the amount of the disease. Three applications of fungicide were necessary. A fungicide containing calomel and corrosive sublimate gave the best long-term control; a fungicide containing a phenyl mercury compound showed promise. The importance of nitrogen in grass recovery from disease attack is emphasized.

3995. Lebeau, J. B., and Cormack, M. W.
A simple method for identifying snow mold damage on turf grasses.
Phytopathology, 1956, **46**: 298, bibl. 2.

Snow mould damage on turf may be distinguished from damage by drought, trampling and frost by the presence of HCN in infected plants.—Plant Path. Labs, Edmonton and Lethbridge, Alberta.

3996. Sherman, M.
Control of the lawn armyworm.
Hawaii Fm Sci., 1956, **4**(4): 1, 7, illus.

The lawn armyworm, *Spodoptera mauritia*, is a new pest of lawns in Hawaii. The larvae eat the leaves, producing brown patches, but do not damage the roots. It can be controlled by spraying or dusting with DDT or chlordane, and the egg masses swept away with a broom. Numbers are reduced by various biological control factors. J.R.L.

3997. Kerr, S. H.
Chinch bug control on lawns in Florida.
J. econ. Ent., 1956, **49**: 83-5, bibl. 10.

Satisfactory control of chinch bug, *Blissus insularis*, attacking St. Augustine grass lawns was obtained at 4 locations with DDT and parathion. On a thin turf other materials were also effective but on thick, lush grass they were less satisfactory.

3998. Escritt, J. R.
Calcium arsenate for earthworm control.
J. Sports Turf Res. Inst., 1955, **9**: 28-34, bibl. 7.

In co-operative trials calcium arsenate controlled earthworms satisfactorily in turf but generally there was some turf disfiguration. The results suggest that commercial calcium arsenate should not be used on fine turf, but might be tried on other turf areas at a rate not exceeding 1½ oz. per sq. yd.

Roses.

(*See also* 3236, 3538, 3945, 3960, 4132, 4281.)

3999. (Rowley, G. D.)
Rose-stock trials.
A.R. John Innes hort. Instn, 1955, 1956, pp. 12-13.

Larger plants and more flowers were produced on *Rosa multiflora* and "Polmeriana" stocks than on 6 other rootstocks. Frost damage was most severe in plants on *R. multiflora*. No significant differences in stock effect were observed for failure to establish after transplanting, for susceptibility to mildew, black-spot and die-back, or for the time of the peak summer and autumn flowering periods.

4000. Lenander, S.-E.
Sort- och grundstamförsök med polyantharosor vid Alnarp 1948-1955. (**Variety and rootstock trials with polyantha roses at Alnarp 1948-1955.**) [English and Esperanto summaries 1¾ and 1½ pp.]
Medd. Trädgårdsförs. Malmö **96**, 1956, pp. 32, bibl. 12.

Two rose trials, with 24 and 16 varieties, were planted on a medium clay and a more sandy soil; the rootstocks used were *Rosa canina*, *R. multiflora* and *R. rugosa hollandica*. *Rosa canina* was the hardiest stock and *R. rugosa* the most frost sensitive. *Rosa multiflora* was more vigorous than the other stocks, induced earlier flowering and produced 20% more flowers. There were marked varietal differences in the time flowers lasted, and this character was also influenced by rootstock. No differences in disease resistance were found between the stocks.

4001. van Lint, H.
Onderstammenproef met botanische rozen. (**Rootstock trials with rose species.**)
Jaarb. Proefst. Boomkw. Boskoop 1955, pp. 54-6.

Rosa Persian Yellow and *R. hugonis* were budded on *R. canina*, *R. multiflora* and *R. eglanteria* rootstocks. Results with *R. hugonis* were very poor. *Rosa* Persian Yellow "took" best on *R. eglanteria*; results on *R. canina* were poor.

4002. Lindstrom, R., and Kiplinger, D. C.
Blind wood of Better Times roses as affected by selection of stock and nitrogen and potassium nutrition.
Proc. Amer. Soc. hort. Sci., 1955, **66**: 374-7, bibl. 3.

A 3-year study was made to determine whether the percentage of non-flowering shoots in Better Times roses was affected by inherent or nutritional factors. With own-rooted plants the percentage of blindness was not affected by (*a*) the position of the parent plant on the bench (N. or S.), (*b*) the age of the parent plant, (*c*) whether the cutting was taken from blind or flowering wood, or (*d*) the productivity of the parent plant. With budded plants the percentage of blindness was not affected by nitrate N or K levels.—Ohio agric. Exp. Stat., Wooster.

4003. White, H. E.
Chlorosis of greenhouse roses and gardenias corrected by use of chelated iron and a chelating agent.
Down to Earth, 1956, **11**(4): 14-16, illus.

In experiments at the University of Massachusetts various rates of chelated iron, NaFeEDTA and of the chelating agent Na_3EDTA were applied to chlorotic greenhouse roses and gardenias as soil treatments, and the chelated iron was also applied to the leaves of roses. Soil applications of either material cured chlorosis in both plants without causing any injury, but the foliar application of the chelated iron to roses injured new growth. On the basis of these experiments and more recent observations it is recommended that under New England soil conditions roses and gardenias should be treated with 8 to 10 oz. of iron chelate per 1,000 sq. ft., preferably twice a year, in early spring and in the autumn.

4004. Fry, P. R., and Hunter, J. A.
Rose-mosaic virus in New Zealand.
N.Z. J. Sci. Tech., Sect. A, 1956, **37**: 478-82, bibl. 3, illus.

In New Zealand rose-mosaic occurs as 2 distinct symptom forms, vein banding and line pattern. Transmission studies indicate that vein banding and line pattern are caused by distinct virus entities, both transmissible by budding.—D.S.I.R., Auckland.

4005. Jefferson, R. N., and Morishita, F. S.
Azobenzene-aramite and azobenzene-chlorobenzilate sprays for resistant spider mites on greenhouse roses.
J. econ. Ent., 1956, **49**: 151-3, bibl. 7.

The writers report excellent control on roses of strains of the two-spotted spider mite, *Tetranychus telarius*, which had shown resistance to aramite and chlorobenzilate, after these two sprays had been combined with azobenzene. Bleaching of the white and pink blooms, a serious problem with azobenzene fumigation, did not occur.—Univ. Calif., Los Angeles. J.R.L.

4006. Karlin, E. J., Naegele, J. A., and Johnson, G. V.
A boon or a burden: screening for thrips control.
Bull. N.Y. St. Flower Grs, 1956, No. 128, pp. 1-2.

In preliminary tests in several rose houses during two seasons screening the side vents with untreated cheesecloth reduced thrips infestation by more than 50%, and screening both top and side vents with cheesecloth dipped in 15% dieldrin emulsifiable concentrate gave nearly 100% control. Screening raised greenhouse temperatures by up to 10° F., which made working conditions trying but did not affect flower quality.—Cornell Univ. and Agric. Res. Serv., U.S.D.A.

4007. Weinstein, L. H.
Chemical changes associated with senescence of Better Times roses.
From abstr. in *Plant Physiol.*, 1956, **31** (Suppl.): iv.

Natural senescence and senescence of cut roses in water were characterized by a decrease in the concentration of anthocyanin, protein N, asparagine and tannic acid, and an increase in most amino acids, glutamine, malic acid and free ammonia in the petal tissues. In natural senescence there was a large accumulation of glucose, whereas in ageing cut roses the glucose was rapidly depleted.—Boyce Thompson Inst., N.Y.

Other trees and shrubs.

(*See also* 3252, 3301, 3313, 3315a, 4030h, i, s, t, z, 4031a, b, f, g, i-n, v, 4266, 4268.)

4008. de Boer, S.
Het overwinteren van stekken. **(Overwintering of cuttings.)**
Jaarb. Proefst. Boomkw. Boskoop 1955, pp. 23-4.

Cuttings of *Azalea mollis* × *sinensis* and *Prunus glandulosa alboplena* showed improved overwintering when the frame was insulated by a layer of linen material. In a double frame *Azalea mollis* × *sinensis* cuttings overwintered better in the soil than in pots.

4009. Hansen, E.
Forsøg og prøver med kvistpoding ved NLH. **(Grafting experiments at the Norwegian College of Agriculture.)**
Gartneryrket, 1956, **46**: 309-10, illus.

With lilac, date of budding or grafting between 16 March and 11 May had little influence on scion growth in the same season, but delaying the operation until 20 May had an adverse effect. Similar results were obtained in grafting *Ulmus glabra exoniensis*.

4010. Egberts, H.
Onderzoek naar gebreksverschijnselen in boomkwekerijgewassen. **(Studies on deficiency symptoms in woody ornamentals.)**
Jaarb. Proefst. Boomkw. Boskoop 1955, pp. 74-5, illus.

Prunus varieties in soils with a high pH showed Mn-deficiency chlorosis. On peat soils chlorosis in Japanese azaleas was due to Fe deficiency and was corrected by a soil application of 0·25% Fe sequestrene solution. Rhododendron leaf colour was improved by heavy N applications.

4011. Egberts, H.
De invloed van de zuurgraad (pH) van de grond op verschillende boomwekerijgewassen. **(The effect of soil pH on different woody ornamentals.)**
Jaarb. Proefst. Boomkw. Boskoop 1955, pp. 68-71.

In a sandy soil growth of *Crataegus monogyna* was not related to pH. *Tilia platyphylla* grew best at pH 5·5–5·9 and *Ligustrum ovalifolium* at pH 6·1–6·8 or higher.

4012. Egberts, H.
Ontbladering van boomkwekerijgewassen met chemische middelen. **(Defoliation of woody plants by chemicals.)**
Jaarb. Proefst. Boomkw. Boskoop 1955, pp. 122-4.

In trials with many ornamental trees and shrubs and fruit tree rootstocks the defoliants DF liquid and EO 12 gave better results than TA 72. In most cases, however, even the former materials caused some damage to the stem tips and terminal buds. Chemically defoliated *Forsythia* plants did not force so well as untreated plants. Treatment with 2% EO 12 caused rapid leaf fall and no damage only in the case of *Hydrangea petiolaris*, *Alnus cordata*, *Corylus colurna*, *Philadelphus coronarius*, *Ginkgo biloba* and *Sophora japonica*.

4013. Milaire, H., and Joly, S.
Lutte contre la cochenille du mûrier sur arbres et arbustes d'ornement. **(Control of mulberry scale on ornamental trees and shrubs.)**
Arboric. fruit., 1956, No. 27, pp. 12-13, illus.

Ornamental species susceptible to attack by the mulberry scale (*Pseudaulacaspis pentagona*) are listed. Control was obtained in nurseries with a spray of yellow oil at the beginning of February followed by 2 sprays of parathion in oil, one at the end of May and the other in mid-August.

4014. Richardson, S. D.
The influence of rooting medium on the structure and development of the root-cap in seedlings of *Acer saccharinum* L.
New Phytol., 1955, **54**: 336-7, bibl. 3, illus.

Roots of first-year seedlings of the silver maple, *Acer saccharinum*, in a loamy soil showed normal root-cap structure and development. In water cultures the root-cap was either absent or present only as a loosely aggregated sheath; no new root-cap cells are formed when the sheath disintegrates. In gravel cultures the root-cap structure was normal, but with growth the cap was shed as an entire unit and was replaced by a new cap of younger cells.

4015. Richardson, S. D.
Photosynthesis and root growth in tree seedlings.
Landbouwk. Tijdschr., 1956, **68**: 775-82, bibl. 10.

Measurements relating root growth to photosynthesis showed that in *Quercus borealis* seedlings root growth was not affected by light intensity. Both *Acer pseudoplatanus* and *A. saccharinum* responded to changes in shoot environment by changes in root growth rate.—Lab. Plantenfys. Onderz., Wageningen.

4016. Germek, E.
Hibridação de primaveras (*Bougainvillea spectabilis* Willd). **(Hybridization of bougainvilleas.)** [English summary 4 lines.]
Bragantia, 1954, **13**: v–vii, bibl. 1, illus.

New types of *Bougainvillea spectabilis* have been obtained by collecting and growing seed from natural pollinations. A technique of emasculation and artificial pollination is also described.

4017. Bruce, A. B., and Ross, R.
Grafting clematis.
Gdnrs' Chron., 1956, **139**: 614-15, illus.

The most successful stock is *Clematis vitalba*, and vigorous seedlings should be used. After whip grafting the plants should be put in a frame in sterilized compost at 65° F. with maximum humidity. Careful ventilation is needed after union.

4018. van Lint, H.
Proeven met *Cotoneaster* onderstammen. **(Experiments with *Cotoneaster* rootstocks.)**
Jaarb. Proefst. Boomkw. Boskoop 1955, pp. 50-2.

In comparative trials *Cotoneaster multiflora* grew better on *C. acutifolia* than on *C. bullata*, *C. dielsiana*, *C. divaricata*, *C. zabelii*, *Sorbus aucuparia* or *Amelanchier canadensis*.

4019. Messing, J. H. L.
Visual symptoms of mineral deficiencies in hydrangea.
A.R. Cheshunt exp. Res. Stat. 1954, 1956, pp. 59-63, bibl. 4, illus.

Established hydrangea plants grown in sand culture were rapidly and markedly affected by the omission from the nutrient solution of N, K, Mg, B or Al. The omission of P, S or Ca had less pronounced effects, and the omission of Mn or Fe no effect whatever. Deficiency symptoms are indicated in each case. The effects of various levels of Al on foliage and flower colours are also recorded.

4020. Frank, H., and Renner, O.
Über Verjüngung bei *Hedera helix* L. **(On rejuvenation of *Hedera helix*.)**
Planta, 1956, **47**: 105-14, bibl. 13, illus.

Rejuvenation of ivy was induced by treatment of the buds with cold or with X-rays, but not with IAA or hydrocyanic acid gas. When mature cuttings were grown in solution culture with juvenile cuttings, rejuvenation followed rooting. Juvenile shoots always rooted. It is considered that a growth substance formed mainly in the roots of juvenile plants can induce rejuvenation in mature plants if it is translocated in sufficient quantity to the buds of the latter.—Bot. Inst., Univ. Munich.

4021. Walker, J., and Wilner, J.
Germination studies with seeds of *Prinsepia sinensis* Oliv.
From abstr. in *Agric. Inst. Rev.*, 1956, **11**(3): 35.

Stratification of mature *Prinsepia sinensis* seeds resulted in uniform germination. Immature seeds, when sown in conditions favourable for growth, germinated quickly and uniformly.—For. Nursery Stat., Indian Head.

4022. de Vogel, P.
Proeven met *Prunus* onderstammen. **(Trials with *Prunus* rootstocks.)**
Jaarb. Proefst. Boomkw. Boskoop 1955, pp. 52-4.

Various rootstocks were tested for ornamental *Prunus* species. *Prunus triloba* made the strongest growth but had the lowest percent take on St. Julien A. French and Dutch seedlings of St. Julien resulted in moderate growth, but Myrobalan B was poor. For forcing quality St. Julien French seedling was best. *P. cistena:* The percent take was best (100%) on St. Julien French seedling but growth of shoots was poor. Myrobalan B and St. Julien A were most satisfactory. *P. blireiana* made the strongest growth but had the lowest percent take on St. Julien A. The highest percent take but poorest growth was given by the St. Julien Dutch seedling. *P. persica* var. Clara Meyer: Blauwe Kroos gave the best results but cannot be recommended as it is virus-infected. *P. amygdalis* did best on Blauwe Kroos and Gele Kroos. Common Mussel and Myrobalan B were unsatisfactory.

4023. Rhododendron-Gesellschaft, Bremen.
Rhododendron und immergrune Laubgehölze. Jahrbuch 1956. **(Rhododendron and evergreen woody plants. Yearbook 1956.)**
Rhododendron-Gesellschaft, Bremen, 1956, pp. 92, bibls, illus.

The yearbook includes articles on cuttings from shy rooting rhododendron hybrids [see next abstract], lime-tolerant rhododendron species, the response of rhododendron species to soil pH (with a bibliography of 57) and an identification key for horticulturally important rhododendron species (pp. 36).

4024. Berg, J., and others.
Stecklingsbewurzelung bei schwer bewurzelbaren Rhododendron-Hybriden. 1. Mitteilung. **(The rooting of cuttings from shy rooting rhododendron hybrids. 1st Communication.)**
Rhododendron immergr. Laubg. Jahrb. 1956, pp. 21-7, illus.

Preliminary trials have shown that soil heating in the propagation bed (about 18° C.) greatly enhances callus formation, root development and root quality in cuttings from shy rooting rhododendron hybrids. The application of 100 mg. indolebutyric acid in 10 g. lanolin was a further aid, though only with the more difficult subjects. Final results will be published in the Yearbook for 1957.

4025. Kohl, H. C., and Sciaroni, R. H.
Bud initiation of azaleas.
Calif. Agric., 1956, **10**(5): 15, illus.

Tests have shown that in Californian coastal regions, where climatic conditions enable flower bud initiation to take place over a long period, better forcing plants are obtained if all the branches on the plants are pinched out at the same time. This should not be done too early in the season or lateral shoots are produced, or too late for then the flower buds will not develop sufficiently. August is recommended for most varieties. J.R.L.

4026. Kubo, A.
On the germination of the pollen-grains of Ericaceae.
Jap. J. Bot., 1955, **15**: 15-27, bibl. 8.

Gelatin was the best germination medium for pollen of various *Rhododendron* spp. Agar was unsatisfactory. Other factors influencing germination are discussed.—Bot. Inst., Hiroshima Univ.

4027. Teuscher, H.
Montgomery blue spruce.
Amer. Nurserym., 1956, **103**(9): 9, 83-4, illus.

Picea pungens glauca clone Montgomery is a handsome, dwarf form of the Colorado spruce, but unlike the latter it can be easily grown from cuttings. The best results have been obtained with young shoots set in a cold frame at the end of June and with cuttings taken at the end of February and in early March and set in a greenhouse with bottom heat. Cuttings taken between August and January gave unsatisfactory results. The best rooting medium was a moderately fine, slightly acid sand. The addition of peat moss was detrimental, as were hormone treatments and the use of mist, whether constant or intermittent.—Montreal bot. Gdn.

4028. Snyder, W. E.
Effect of photoperiod on cuttings of *Taxus cuspidata* while in the propagation bench and during the first growing season.
Proc. Amer. Soc. hort. Sci., 1955, **66**: 397-402, bibl. 6.

The lateral buds of yew cuttings remained dormant for up to 10 months when exposed to 8-hour photoperiods, whereas elongation of lateral shoots occurred less than 30 days after cuttings were exposed to 18-hour photoperiods. There was no significant effect of photoperiod on the rooting of cuttings or the development of the root system during the first growing season. No correlation was found between rooting response and degree of lateral bud activity. Rooted cuttings in which shoot activity had been inhibited by short-day treatment during the propagation period made significantly more growth during the growing season, under both natural and long-day conditions, than cuttings in which lateral shoot growth had occurred during the propagation period.—Cornell Univ., Ithaca, N.Y.

4029. Weidhaas, J. A., Jr., and Shaw, F. R.
Control of the taxus mealybug with notes on its biology.
J. econ. Ent., 1956, **49**: 273-4, bibl. 6.

A severe infestation of the taxus mealybug, *Pseudococcus cuspidatae*, was eliminated by the application of sprays containing malathion-DDT wettable powder. Formulations of BHC were not effective in controlling this pest. [Authors' summary.]—Dep. Ent., Univ. Mass., Amherst.

Noted.

4030.

a Anon.
Do you have ants . . . in your lawn, that is?
Me Fm Res., 1956, **4**(2): 9.
Chlordane as an aerosol bomb, very effective.

b Basteleus, R.
Sanseveria trifasciata.
Bull. hort. Liège, 1956, **11**: 12-17, bibl. 4, illus.
History, varieties and culture as an ornamental.

c Berninger, L. M., and Beck, G. E.
How to grow African violets.
Circ. agric. Ext. Serv. Univ. Wis. **437,** revised 1955, pp. 5, illus.
Early edition noted *H.A.*, **24**: 735c.

d Brown, E. B.
A seed-borne attack of chrysanthemum eelworm (*Aphelenchoides ritzema-bosi*) on the annual aster (*Callistephus chinensis*).
J. Helminth., 1956, **30**: 145-8, bibl. 3, illus.
Symptoms, etc. [see also *H.A.*, **25**: 1899].

e Cahoon, G. A., and Crummett, D. O.
The potassium nutrition of stocks, *Matthiola incana.*
Proc. Amer. Soc. hort. Sci., 1955, **66**: 364-73, bibl. 21.
A fuller account of work reported in *H.A.*, **25**: 823.

f Caro, J. A.
Las especies de *Duranta* ("Verbenaceae") silvestres y cultivadas en la República Argentina. **(The wild and cultivated species of *Duranta* (Verbenaceae) in Argentina.)** [English summary ⅜ p.]
Rev. argent. Agron. B. Aires, 1956, **23**: 1-28, bibl. 117, illus.
A systematic study, covering some ornamental species.

g Carpenger, B. E.
The all-rubber type underground sprinkler systems.
Amer. Nurserym., 1956, **103**(9): 14, 74-6, illus.
For lawns.

h Corliss, C. D.
Container stock growing in the East.
Amer. Nurserym., 1956, **103**(12): 14, 81, illus.
A nurseryman's method of growing woody ornamentals in cans with a removable bottom.

i Cuisance, P.
Les dégâts causés par les gelées aux arbres et arbustes d'ornement. **(Frost damage to ornamental trees and shrubs.)**
Rev. hort. Paris, 1956, **128**: 1486-90, illus.
In February 1956; comments on behaviour of many species.

j Debuisson, J.
Nos chrysanthèmes. Leur origine—Leur nombre chromosomique. **(Our chrysanthemums. Their origin and chromosome numbers.)**
Bull. hort. Liège, 1956, **11**: 168-70, illus.

k Desai, B. L.
A good lawn is an asset.
Indian Fmg, 1956, **6**(1): 16-19, illus.
Lawn establishment and care in India.

l Faulkner, T. D.
The handling of bare-root stock.
Amer. Nurserym., 1956, **104**(1): 124-7.
Organization, stacking and grading of woody ornamentals in a nursery.

m Gaarder, P.
Prøvedyrking av høstfloks og hageiris 1929-55. **(Phlox and iris variety trials 1929-55.)**
Gartneryrket, 1956, **46**: 457-63, illus.

n Gerlach, W.
Eine weit verbreitete Pilzkrankheit an Alpenveilchen. **(A widespread fungus disease of cyclamen.)**
Gartenwelt, 1956, **56**: 170-1, bibl. 2, illus.
Cylindrocarpon radicicola; symptoms and control by hygiene.

o Ghafoor, A.
***Phytophthora* wilt and foot rot of antirrhinum.**
From abstr. in *Proc. 6th Pakistan sci. Conf., Karachi, 1954, Part III*, pp. 67-8.
Mycological data; control experiments are in progress.

p Gould, C. J.
The Augusta disease—a possible threat to our tulips.
Proc. Bulb. Grs' short Course 1956, Tacoma, Wash., pp. 29-31, bibl. 8.
English and Dutch work on this virus disease reviewed.

q Guillaumin, A.
Euphorbia × *Doinetiana.* Nouvelle Euphorbe cactiforme hybride. **(*Euphorbia* × *Doinetiana,* a new euphorbiaceous cactus-like hybrid.)**
Bull. hort. Liège, 1956, **11**: 77, illus.
Branched like a candelabra.

r Guillaumin, A.
Un nouveau *Bulbophyllum* ornemental. **(A new ornamental *Bulbophyllum.*)**
Rev. hort. Paris, 1956, **128**: 1491, bibl. 5, illus.
Bulbophyllum jacquetti described.

s Heimann, M.
Untersuchungen über das Erikensterben. **(Studies on erica decline.)**
Gartenwelt, 1956, **56**: 155-7, illus.
Search for cause, possibly *Pestalotia versicolor.*

t Highland, H. A.
The biology of *Ferrisiana virgata,* a pest of azaleas.
J. econ. Ent., 1956, **49**: 276-7, bibl. 21.
Controlled by 1·5 qt 57% emulsifiable malathion per 100 gal.

u Hilliar, F. T.
Holland Park and the severe weather.
Gdnrs' Chron., 1956, **139**: 680.
Reaction of many species in London to Feb., 1956, frosts.

v Ignatjeva, I. P.
The propagation of *Papaver orientale* by root cuttings. [Russian.]
Sad i Ogorod, 1956, No. 6, pp. 73-4, illus.

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Lawns in Kansas.
Circ. Kans. agric. Exp. Stat. **327**, 1955, pp. 30, illus.
Species, establishment and maintenance, including pest and weed control.

x Kiplinger, D. C., and Nelson, K. S.
Chrysanthemum flowering period controlled by length of day.
Ohio Fm Home Res., 1956, **41**: 14.
Three schedules and recommended varieties.

y Klinkowski, M.
Beiträge zur Kenntnis der Virosen der Gladiole in Mitteldeutschland. **(Contributions to the knowledge of gladiolus viruses in central Germany.)**
Mitt. biol. Bundesanst. Berlin-Dahlem, 1956, Heft 85, pp. 139-50, bibl. 21, illus.
Symptoms and indicator plants.

z Laibach, F.
Untersuchungen über den Abblühvorgang bei einigen *Cistus*-Arten. **(Studies on the duration of flowering in *Cistus* spp.)**
Beitr. Biol. Pfl., 1955, **31**: 27-43, from abstr. in *Züchter*, 1956, **26**: 160.
With special reference to petal abscission.

4031.

a McBurney, A. D.
Hedges for parks and gardens.
Park Administ., 1956, **21**: 21-5.
Notes on evergreen, deciduous and flowering species in England.

b May, W. B.
Metasequoia glyptostroboides* grafted on *Cryptomeria japonica.
J. roy. hort. Soc., 1956, **81**: 278.
In Kenya, a successful union being formed in 2 months.

c Messing, J. H. L.
The effect of some acute mineral deficiencies on plant growth.
A.R. Cheshunt exp. Res. Stat. 1953, 1954, pp. 53-9, bibl. 16, illus. [received 1956].
Carnations, cyclamen, stocks, dahlias, lettuces and tomatoes.

d Miletić, R.
Rezultati suzbijanja puževa golaća. **(Results of slug control experiments.)** [English summary ¼ p.]
Zasht. Bilja, 1955, No. 32, pp. 73-8, bibl. 7, illus.
Materials based on metaldehyde and BHC for protecting pot plants.

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Descriptive notes on herbaceous perennials for Canadian gardens.
Growing herbaceous perennials.
Publs Canada Dep. Agric. **968** and **970**, 1956, pp. 32 and 24.

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Magnolia acuminata L., agurkmagnolie i Danmark. **(*Magnolia acuminata* in Denmark.)**
Horticultura, 1956, **10**: 97-101, bibl. 21, illus.
Specimens up to 125 years old and entirely hardy.

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***Cupressocyparis leylandii* as a hedge plant.**
Gdnrs' Chron., 1956, **139**: 615, illus.
The hybrid forms a rigid and dense evergreen hedge.

h Pelucca, E.
Appunti di morfologia fiorale della sulla (*Hedysarum coronarium* L.). **(Notes on the floral morphology of french honeysuckle (*Hedysarum coronarium*).)**
Ann. Fac. Agrar. Perugia, 1954, **10**: 70-81, bibl. 8, illus.

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Leaf blight disease of *Citrus acida* var. *variegata*.
Proc. Indian Acad. Sci. Sect. B, 1956, **43**: 325-33, bibl. 5, illus.
An ornamental citrus attacked by *Colletotrichum gloeosporioides*; control not considered.

j RAO, U. N., AND MUTHUSWAMY, S.
The white *Bougainvillea*.
S. Indian Hort., 1955, **3**: 114-15, bibl. 2.
Introduction into India.

k RATNAWEERA, E. W.
The cultivation of cacti and succulents in Ceylon.
Trop. Agriculturist, 1955, **111**: 204-10, bibl. 6, illus.
Propagation and culture as house plants.

l SACHS, R. M.
Floral initiation in *Cestrum nocturnum*. I. A long-short day plant.
Plant Physiol., 1956, **31**: 185-92, bibl. 22.

m SCHMIDT, M. G.
Concerning *Ceanothus*.
Nat. hort. Mag., 1956, **35**: 59-69, illus.
Notes on species and hybrids.

n SCHNITZIUS, H. J., AND BAREITHER, M. J.
Japanese hollies in Indiana.
Amer. Nurserym., 1956, **104**(1): 132-4.
Requirements and varieties.

o SHIMOKORIYAMA, M.
Sugar-containing sap in the flower-buds of *Cosmos* and *Coreopsis*.
Jap. J. Bot., 1955, **15**: 56-9, bibl. 12.

p STEFFEN, L.
Eine neue Blumenzwiebel-Pflanzmaschine. **(A new bulb-planting machine.)**
Gartenwelt, 1956, **56**: 230, illus.
Dutch machines planting 1 to 5 rows of bulbs, including onions and shallots.

q STEVENSON, V.
Flower containers. Testing non-returnables.
Comm. Gr, 1956, No. 3156, pp. 1168-9, illus.
Small-scale trials with sweet peas.

r STEWART, R. N., AND SCHINDLER, A. F.
The effect of some ectoparasitic and endoparasitic nematodes on the expression of bacterial wilt in carnations.
Phytopathology, 1956, **46**: 219-22, bibl. 28, illus.
Including evidence of varietal resistance to nematodes.

s STEYER, G.
Über die Ursachen des vorzeitigen Abwurfes von Blütenteilen bei *Coleus*. **(On the causes of premature flower abscission in *Coleus*.)**
Beitr. Biol. Pfl., 1955, **31**: 15-26, from abstr. in *Züchter*, 1956, **26**: 160.

t WERCKMEISTER, P.
Cyclamen und Cyclamenfarbstoffe. **(Cyclamen and cyclamen pigments.)**
Saatgut-Wirtsch., 1956, **8**: 104, bibl. 2.
A postscript to previous article [see *H.A.*, 26: 1999].

u WILSON, J. Y.
Polyploidy in bluebells (*Endymion non-scriptus* and *E. hispanicus*).
Nature, 1956, **178**: 195-6, bibl. 8, illus.

v ZIELINSKI, Q. B.
***Escallonia:* the genus and its chromosomes.**
Bot. Gaz., 1955, **117**: 166-72, bibl. 23, illus.
In all 21 species and horticultural hybrids examined $2n=24$.

SUB-TROPICAL FRUIT AND PLANTATION CROPS.

Avocadoes.

(*See also* 3246, 3280, 3282, 3325, 4048, 4049, 4127e, l, 4128e.)

4032. LYNCH, S. J., AND NELSON, R. O.
Current methods of vegetative propagation of avocado, mango, lychee and guava in Florida.
Ceiba, 1956, 4: 315-37, illus., from abstr. in *Biol. Abstr. Sect. D*, 1956, **30**, No. 20355.

For avocado the side-graft method is now preferred, occasionally supplemented by use of the side veneer or the small cleft graft. For mango the principal methods used are side-veneer grafting, chip and modified chip budding, and side grafting. At present, practically all lychee propagation in Florida is by air layers. For grafting guavas, particular recommendations are given as to treatment of stocks and graftwood selection. Detailed descriptions are given of the methods for all of these fruits. A most important improvement in recent years has been the use of vinyl plastics for binding the grafts. This material retains moisture, but permits the escape of debilitating metabolic gases.

4033. HAAS, A. R. C., AND BRUSCA, J. N.
Growth response of rooted leafy-twig avocado cuttings to soil applications of 2,4-D.
Citrus Leaves, 1956, **36**(5): 18, 22, bibl. 3, illus.

In one sand culture trial rooted cuttings of Zutano avocado did not respond to additional phosphate in the nutrient solution. In a second trial growth was markedly stimulated by the addition of 0·015 or 0·020 p.p.m. of 2,4-D to the nutrient solution.

4034. MUSTARD, M. J.
Fundamentals of panicle differentiation.
Proc. Fla Lychee Grs' Ass., 1954, **1**(1): 7-8, from abstr. in *Biol. Abstr., Sect. D*, 1956, **30**, No. 8611.

The differentiation and development of avocado and mango panicles is described. Mention is made of some of the factors believed directly or indirectly to influence flower initiation.—Univ. Miami.

Citrus—general.

(*See also* 3264, 3325, 4125, 4127b, c, m, w, z, 4128f, l-n, 4280.)

4035. ISRAEL EXPORT JOURNAL.
Special citrus issue.
Israel Export J., 1956, **8**(5): 14-51.

This publication is dedicated to the 4th International Congress of Mediterranean Citriculture, held at Tel Aviv in May 1956, and may serve as a general introduction to some 20 research papers from Israel that are to be found in this section of *H.A.* A series of articles is presented under three main headings: the citrus grove, the citrus processing industry, and shipping and marketing. Articles under the first of these headings deal with planning in the citrus industry, co-operative growing and marketing, research, irrigation, fertilizer practices, rootstocks and varieties, diseases and pests, and new developments in plantation layout.

4036. SAVAGE, Z.
Relationship of yield to age of trees and trees per acre.
Citrus Ind., 1956, **37**(6): 6, 18, and *Citrus Mag.*, 1956, **18**(10): 6-7.

Data have been collected to find the relationship between numbers of orange and grapefruit trees per acre and their yields at various ages, between 5 and 50 years. The per-acre yield of young trees was found to be directly proportional to their age. This continued until crowding occurred, after which yields gradually declined. Oranges planted at 90 and 99 trees per acre reached their highest yields at 25 to 29 years, trees at 80–89 trees per acre at 30–34 years. Grapefruit trees at the same spacings as oranges became crowded when younger.—Fla agric. Exp. Stats, Gainesville. J.R.L.

Citrus—propagation and rootstocks.

(*See also* 3341, 4127q, r, x, 4128g.)

4037. COHEN, A.
Studies on the viability of citrus seeds and certain properties of their coats.
Bull. Res. Coun. Israel, Sect. D Bot., 1956, **5**: 200-9, bibl. 11.

Viability of citrus seeds was tested by using resazurin, which gives results in 54 hours. At 25° C. removal of the seed coat accelerated germination; removal of both testa and tegmen was significantly more effective than removal of testa only. Water intake was delayed for several days by intact seed coats. Water extracts of the testa contained a substance inhibiting germination and growth of wheat and citrus seeds. The inhibiting factor was removed or inactivated by 2 weeks' stratification. Chemical treatment of the seed coat under normal nursery conditions did not promote germination, owing, it is thought, to low temperatures.—Fac. Agric., Hebrew Univ., Rehovot.

4038. MENDEL, K.
Rootstock-scion relationships in Shamouti trees on light soil.
Ktavim, 1956, **6**: 35-60, bibl. 39.

The results are reported of an experiment at Rehovot lasting 18 years, in which Shamouti oranges have been grown on 9 rootstocks, namely sweet lime, rough and sour lemons, citron, Baladi and Shamouti sweet oranges, sour orange, grapefruit and shaddock. The largest trunk girths have been produced by the two lemon stocks and the smallest by grapefruit and citron. The largest crowns occurred on the two lemons and the smallest on grapefruit and shaddock. The relationship between trunk diameter and crown size, which was close in young trees, has diminished with maturity. The growth habit (height/width ratio) of the scion has resembled that of the stock. The bud-unions have varied in smoothness, depending on the stock, but in some cases uneven unions could be attributed to diseases. Tree health has been excellent on the two lemons and on the Baladi and sour oranges. Some decline, for which no pathological cause has been found, has occurred in trees on Shamouti, shaddock and grapefruit. Xyloporosis and brown rot have occurred in trees on sweet lime, and brown rot has been severe in trees on citron. Yields have been highest on the two lemons, especially the sour lemon, moderate on sweet lime and citron, below average on the oranges and very poor on grapefruit and shaddock. Fruit size and peel thickness have been greater, and the total soluble solids percentage lower, on lemon-type than on orange-type stocks. Acid contents have been generally, but not invariably, lower on lemon-type stocks than on orange-type stocks. The TSS/acid ratio has not been greatly influenced by stock, but at the official minimum ratio of 7·5 for fruit maturity in Israel the fruit on all stocks was still sour; the minimum ratio should be raised to 8·0.

4039. GOLDSCHMIDT-BLUMENTAL, S.
Rootstock-scion influences in the morphology and anatomy of the bud union of Shamouti orange.
Bull. Res. Coun. Israel Sect. D Bot., 1956, **5**: 143-54, bibl. 25, illus.

The morphology and anatomy of bud unions formed by mature Shamouti trees on 9 rootstocks is described. The width of scion vessels was found to be influenced by rootstock. The compatibility of rootstock and scion appeared to be considerably affected by their relative water conductive cross-sections. In general the cross-section was generally bigger in the rootstock than in the scion, except in the case of grapefruit and shaddock stocks, where the relation was reversed. The structure of the bud union did not always indicate the degree of compatibility between stock and scion.—Fac. Agric., Hebrew Univ., Rehovot.

4040. COOPER, W. C., AND OTHERS.
Review of studies on adaptability of citrus varieties as rootstocks for grapefruit in Texas.
J. Rio Grande Valley hort. Soc., 1956, **10**: 6-19, bibl. 23.

The authors review the results of work started in 1946 at 5 locations, where Shary Red or Webb Red Blush grapefruit scions had been worked on to 135 different citrus varieties used as rootstocks. Records were made of the resistance of the trees to disease, including cachexia, Rangur lime disease, xyloporosis, foot rot and other disorders (no tristeza was found), and of their tolerance to salt, boron, lime and cold weather. J.R.L.

Citrus—tree composition and nutrition

(*See also* 3280, 3282.)

4041. RAPALLO ABAD, J.
La fertilización del naranjo. **(Fertilizing orange trees.)**
Siembra, 1955 (Oc .), pp. 22-4, from abstr. in *Fruits d'Outre Mer*, 1956, **11**(5), No. 1097.

A recommended fertilizer programme for oranges in Spain is 80 kg. of manure per tree every 5 or 6 years and an annual application, after harvesting, of 3-4 kg. of a mixture of 44 kg. of 18% superphosphate, 36 kg. of $(NH_4)_2SO_4$, 16 kg. of KCl and 4 kg. of $FeSO_4$. A tendency to puffiness in the fruit can be corrected by replacing 6 kg. of $(NH_4)_2SO_4$ by the same weight of KCl.

4042. HEYMANN-HERSCHBERG, L.
A survey of the effect of fertilizing practices on the macronutrient composition of citrus leaves in Israel.
Ktavim, 1956, **6**: 17-33, bibl. 30.

The leaf-analysis survey reported earlier [*H.A.*, 25: 4283] has been extended, and the data now presented cover high-performance orchards as well as groves in which nutritional problems were suspected because of undesirable external fruit characteristics or because the soils contained high lime contents. The results show that increasing applications of quick-acting N- and P-fertilizers were reflected in increased leaf-N and P but did not affect yields or external quality of fruit. In many groves high yields of good quality fruit were produced with moderate N and infrequent P applications. Although most groves had received no K fertilizers for 10 or more years, no K deficiency was evident. A single K application tended to increase leaf K. In orchards yielding small fruit the ratio $Ca+Mg/K$ tended to be relatively high. In all groves leaf-Ca was within the optimum range and was not significantly increased by high soil-Ca contents. The leaves in the best groves contained 0·200%±0·02% Mg compared with 0·178% in groves on calcareous soils and 0·166% in groves producing coarse fruit. External Mg-deficiency symptoms were associated with less than 0·17% leaf-Mg and even more consistently with a ratio below 3·0 of $Mg\times100/Ca+K+Mg$. The leaves of grapefruit trees differed from those of Shamouti orange trees by containing lower N, P and K and larger Ca and Mg concentrations.—Agric. Res. Stat., Rehovot.

4043. WILLIAMS, R. F., AND GATES, C. T.
Studies in citrus nutrition. I. Leaf growth and composition.
Aust. J. agric. Res., 1956, 7: 248-60, bibl. 18.

Vegetative shoots from the spring flush of an experimental citrus grove were tagged and sampled on three occasions at intervals of 6 months. The effects of four cultural treatments, four levels of N supply, four combinations of stock and scion, and of time on leaf area and dry weight, and on relative and absolute contents of water, N and P are presented and discussed. While N nutrition is still the dominant factor, the evidence strongly suggests that P nutrition has become important as a determinant of treatment effects within the experimental grove. The possible relevance of soil temperature and soil organic matter for some of the cultural treatment effects is discussed. [Authors' summary.]—Irrig. Res. Stat., C.S.I.R.O., Griffith, N.S.W.

4044. BOUMA, D.
Studies in citrus nutrition. II. Phosphorus deficiency and fruit quality.
Aust. J. agric. Res., 1956, **7**: 261-71, bibl. 7.

The effects of four cultural treatments and four N levels on fruit quality, percentage leaf P, and percentage leaf N in an experimental citrus orchard are presented. In general, the trees in the tilled treatments, which receive some superphosphate to secure a good growth of the winter cover crop, produce fruit of better quality than those in the no-tillage treatments. Increasing levels of N supply in the latter cause a marked decrease in fruit quality. This effect is associated with a decrease in leaf P in these treatments. Analyses of soils in the different cultural treatments point also to an unfavourable P status for the no-tillage treatments. A comparison with earlier results in this experiment indicates that fruit quality, particularly in the no-tillage treatments, is deteriorating. This progressive decline is shown to be related to a deterioration in the P status of the trees in these treatments. Highly significant correlations are reported between fruit quality indices and leaf P content. Less significant correlations were established with readily available soil P. [From author's summary.]—Irrig. Res. Stat., C.S.I.R.O., Griffith, N.S.W.

4045. GOODALL, G. E.
Lemon fertilizer responses on reddish clay-pan soils.
Citrus Leaves, 1956, **36**(5): 12.
Lemon fertilizer responses.
Calif. Citrogr., 1956, **41**: 318-19.

Combinations of N, P and K were applied to 6-year-old lemon trees, which had not previously been fertilized but were growing in a soil known to be low in available P and K. The leaves showed significant increases of the applied nutrients. The NP treatment produced the highest yield and the greatest profit per tree.

4046. SIMS, W. L., ROHRBAUGH, P. W., AND DAVIS, J. B.
Nitrogen fertilization of citrus.
J. Rio Grande Valley hort. Soc., 1956, **10**: 20-4, bibl. 5.

This is an interim report on a 5-year experiment, in which the response was recorded of Webb Red grapefruit on Cleopatra mandarin and sour orange rootstocks to 2 levels of N fertilizer. The growth of the trees was measured and leaf and soil samples analysed. J.R.L.

4047. FULLER, W. H., AND HILGEMAN, R. H.
The absorption of fertilizer phosphorus by Navel oranges as influenced by root stock and time of application.
Proc. Amer. Soc. hort. Sci., 1955, **66**: 31-5, bibl. 3.

Radioactive liquid H_3PO_4 fertilizer was applied to the soil around Navel orange trees growing on a clay loam low in available P. Leaves and petioles were found to derive as much as 24% of their P from the fertilizer. A greater proportion of the P of leaves and petioles was derived from the fertilizer than from the soil as the period of contact of the roots with the added source increased. Older leaves generally contained less fertilizer P than young leaves, although in most cases the differences were not significant. There was no difference in absorption of P from the fertilizer between trees grown on rough lemon and those on sour orange rootstocks.—Ariz. agric. Exp. Stat., Tucson.

4048. Smith, R. L., and Wallace, A.
Influence of cation ratio, temperature, and time on adsorption and absorption of calcium and potassium by citrus and other plant species.
Soil Sci., 1956, **82**: 9-19, bibl. 11.

Seedlings of lemon, grapefruit, 3 varieties of orange, avocado, runner bean and tomato were supplied with Ca^{45} and K^{42} in culture solutions. Bean roots released more Ca^{45} in Ca solution than in distilled water. Adsorption and absorption of Ca^{45} by excised orange and bean roots depended on concentration and on cation-exchange capacity of the roots. With Ca: K as low as 1: 100 the adsorption of Ca was not reduced by more than about 50%. Uptake of Ca^{45} per unit dry weight was much higher in bean than in the other plants. In citrus there was relatively high accumulation in the roots. Root temperature affected Ca uptake by citrus, tomato and bean and the added effect of K ions was studied in bean. The K content of citrus and bean receiving K^{42} was affected by root temperature and Ca ions. Comparison of results of 12-hour and 36-hour studies throw doubt on the validity of short-time studies, which give wide variations in total Ca uptake in various concentrations. The values of the temperature coefficient, which were independent of nutrient concentration, ranged from just below to just above 1 in short and long experiments on Ca^{45} uptake at temperatures between 7° and 31° C. and in short experiments with K^{42} at temperatures between 18° and 31° C., whether one or both cations were present. In contrast to reports from some sources this indicated considerable diffusion of ions into roots during the study.

4049. Brusca, J. N., and Haas, A. R. C.
Calcium nutrition in citrus trees.
Calif. Citrogr., 1956, **41**: 304-6, illus.

Valencia oranges, Richardson lemons and a Mexican avocado variety were grown in a nutrient solution with various levels of calcium. On both sour orange and trifoliate orange rootstocks the most marked effect when no Ca was added was reduced leaf size. With increasing Ca levels the leaf content of Mg was reduced and the Ca percentage in rootlets, peel and dry matter of the fruit pulp was increased. In lemon on sour orange and in avocado smaller leaves were also produced when Ca was omitted from the nutrient solution.

4050. Cooper, W. C., and Peynado, A.
Iron chlorosis of young Webb Red Blush grapefruit trees grown in calcareous soil as influenced by rootstock and iron chelate treatment.
J. Rio Grande Valley hort. Soc., 1956, **10**: 38-42, bibl. 7.

During the 2 years of a trial of Webb Red Blush grapefruit on 20 varieties of sweet orange and 4 varieties of mandarin used as rootstocks only Shekwasha mandarin showed tolerance to the calcareous soil. Drake Star, Bessie and Florida sweet orange and Kunembo mandarin showed some tolerance in the second season. Fe-aminopolycarboxcylic acid (Fe-APCA) proved more effective in correcting lime-induced chlorosis than Fe-diethylenetriamine pentaacetic acid (Fe-DTPA).
J.R.L.

4051. Armstrong, W. W., Jr., and Furr, J. R.
Experimental control of lime-induced iron chlorosis in trifoliate orange seedlings by soil applications of some iron compounds.
J. Rio Grande Valley hort. Soc., 1956, **10**: 43-8, bibl. 9, illus.

Poncirus trifoliata seedlings were used to test the efficiency of 5 agents for the treatment of lime-induced chlorosis. Ferrous sulphate, iron rich fritted glass, the ferric complex of N-hydroxyethylethylenediaminetriacetic acid (Fe-EEDTA-OH) absorbed in vermiculite, the ferric complex of disodium ethylenediaminetetraacetic acid (Fe-EDTA), and a technical grade ethylenediaminetetraacetic acid (EDTA) were applied at 3 or 4 different rates. Ferrous sulphate was the most effective particularly by the second year, and Fe-EEDTA-OH and Fe-EDTA were more effective than EDTA. Only Fe-EEDTA-OH exhibited any phytotoxicity.—U.S. Date Field Stat., Calif.
J.R.L.

4052. Zusman, P.
Toxic influences of sodium and sulphate ions on citrus seedlings.
Bull. Res. Coun. Israel Sect. D Bot., 1956, **5**: 210-18, bibl. 11, illus.

Toxicity of SO_4 ions to sweet lime and sour orange seedlings became apparent at concentrations above 1,000 p.p.m. At this level the SO_4 content of sour orange leaves was 1·05% and of sweet lime 0·9%. Calcium absorption was reduced with increasing soil sulphate concentrations. Sweet lime seedlings grown in soil containing 1·1 m.e. Na^+ per 100 g. developed symptoms of Na toxicity, whereas sour orange seedlings remained healthy. Seedling development was positively correlated with the Ca/Na ratio in leaves.—Fac. Agric., Hebrew Univ., Rehovot.

4053. Scaramuzzi, G.
Policarenza con sintomi di carenza di zinco, ed altre sintomatologie, su piante di agrumi della riviera garganica. **(Multiple mineral deficiency and other leaf symptoms in citrus on the Gargano coast.)** [English summary $\frac{1}{3}$ p.]
Ann. Sper. agrar., 1956, **10**: 993-1006, bibl. 19, illus.

Three different types of leaf abnormality were observed on oranges and lemons on the Gargano coast in Foggia province. The most important one is due to Zn deficiency accompanied apparently by deficiencies of both Mg and Mn; spraying with the sulphates of these 3 elements plus sodium carbonate resulted in the virtual disappearance of the leaf symptoms and in improved vigour.—Lab. crit. ital., Pavia.

4054. Steyn, W. J. A., and Eve, D. J.
The zinc status of citrus and pineapples in the Eastern Cape.
S. Afr. J. Sci., 1956, **52**: 270-1, bibl. 5.

This is a preliminary report on an extensive analytical survey of Zn deficiency in the soils and crops of the Eastern Cape region. All the leaves sampled from citrus and most of the pineapple leaf samples showed Zn deficiency, except where they had been sprayed with Zn sulphate. Nearly all the soils were deficient in Zn, but it was noticed that the uptake of Zn was increased if the pH of the soil was lowered. The uptake of Zn was depressed if Cu and Zn were applied together.
J.R.L.

4055. Heymann-Herschberg, L.
Effects of combined zinc and sulfur applications on zinc deficiency in orange trees.
Ktavim, 1956, 6: 83-9, bibl. 7, illus.

Zinc, applied either as ZnO combined with sulphur dust or as $ZnSO_4.7H_2O$ in an aqueous spray containing sulphur, lime and a wetter, cured chlorosis in Zn-deficient Shamouti oranges within 48 days. Seven months later there was some recurrence of chlorosis on new growth. The combined application of Zn and S caused no damage to fruit or leaves and was fully effective against the rust mite, *Phyllocoptruta oleivora*—Agric. Res. Stat., Rehovot. [See also abstract 4089.]

Citrus—flowering, pollination and fruit drop.

4056. Minessy, F. A., and Schroeder, C. A.
Pistil development in citrus flowers.
Bot. Gaz., 1956, **117**: 343-7, bibl. 9.

Ringing and defruiting of branches as well as ringing alone favoured pistil development in Eureka lemon flowers above the ring. Ringing and defoliation together and defoliation alone reduced pistil development. A positive correlation was found to exist between fluctations in the starch content of the shoots and the percentage of perfect flowers formed throughout the year.—Univ. Calif., Los Angeles.

4057. Stowe, B. B., Thimann, K. V., and Kefford, N. P.
Further studies of some plant indoles and auxins by paper chromatography.
Plant Physiol., 1956, **31**: 162-5, bibl. 26.

Paper chromatography showed that orange blossoms contained quantities of indole and indole-3-acetic acid together with an unknown growth inhibitor.—Harvard Univ., Cambridge, Mass.

4058. Resnik, M. E.
Influencia de hormonas vegetales sobre la germinación del polen de los citrus. **(Effect of growth substances on the germination of citrus pollen.)**
Bull. Res. Coun. Israel Sect. D Bot., 1956, **5**: 223-4.

The percentage germination of pollen from Meyer lemon in sucrose solution increased with increase in concentration up to 25% sucrose. The addition of 2,4-D, thiamine, boric acid or indolebutyric acid to a 15% sucrose solution medium also increased percentage germination by 10–50%, the amount of increase depending on concentration of the added substance.—Div. Hort., Hebrew Univ., Rehovot.

4059. Shavit, A.
An investigation into the process of flower and fruit abscission of the Shamouti orange.
Bull. Res. Coun. Israel Sect. D Bot., 1956, **5**: 189-99, bibl. 21, illus.

In an examination of Shamouti flowers 77% were found to be abnormal. Staminate flowers in normal trees represented 6·2% of the total and in Zn-deficient trees 11% of the total flower number; staminate flowers became more numerous towards the end of the season. In general the approach of abscission was indicated by the appearance of an intermediate notch on the pedicel and a pronounced colour differentiation of the pedicel. Zn-deficient trees shed 35·8% of the total number of flowers before opening compared with 15·6% in normal trees. In normal trees 45·1% of the flowers reached the young fruit stage compared with 23·8% in Zn-deficient trees. The daily loss due to flower abscission at the height of the blossoming season amounted to 48·58 g. of dry weight. A medium-sized tree lost 34·61 g. N and 3·16 g. P by flower abscission. Flowers opening later in the season had lower N and P contents than those appearing earlier. Severe leaf abscission occurred during blossoming. The shortage of N during and just after flowering is probably the main factor limiting fruit set, although in a trial in which foliar sprays of urea were applied to Clementines higher fruit set was not obtained.—Dep. Hort., Hebrew Univ., Rehovot.

4060. Sattar, A., Hafiz, A., and Ali, R.
Some studies on citrus fruit fall and citrus fruit rot in the Punjab.
From abstr. in *Proc. 6th Pakistan Sci. Conf., Karachi, 1954, Part III*, pp. 74-5.

The studies were conducted at the Punjab Agricultural College, Lyallpur, on oranges, grapefruit and lemon. There appear to be two main causes of fruit drop, physiological (non-parasitic) occurring during July-September and fungal (parasitic) occurring from October onwards. Parasitic fruit drop and fruit rot appear to be connected mainly with attack by *Colletotrichum gloeosporioides*, the incidence of which is markedly influenced by temperature. Preliminary results indicate that both diseases can be controlled to a large extent by correct pruning, manuring and spraying 4 times a year with bordeaux.

4061. Hammond, L. C.
Can irrigation lessen citrus fruit drop?
Citrus Ind., 1956, 37(7): 8, 18.

The results of a small-scale trial on Hamlin orange trees suggests that spring fruit drop can be reduced by applying irrigation water during the drop period, whenever the soil moisture tension at 1 ft. reaches 800 cm. of water. However, further investigations, including watering at other soil tensions, will be necessary before the value of irrigation at this season can be properly assessed.—Coll. Agric., Gainesville, Fla.

4062. Fletcher, W. A.
Facts about controlling pre-harvest drop of citrus.
Orchard. N.Z., 1956, **29**(4): 4-7, bibl. 4, illus.

2,4-D at 20 p.p.m. has been remarkably effective in reducing losses from pre-harvest drop in New Zealand,

and there is evidence that fruit from sprayed trees has a longer storage life than fruit from unsprayed trees.

Citrus—climatic factors.

(*See also* 3246, 3483.)

4063. Halevy, A.
Orange leaf transpiration under orchard conditions. IV. A contribution to the methodology of transpiration measurements in citrus leaves.
Bull. Res. Coun. Israel Sect. D Bot., 1956, **5**: 155-64, bibl. 29.

Transpiration of Shamouti orange trees was measured using detached leaves of mature trees and 2-year-old trees in tins. Measurements were made in normal autumn and summer conditions and on *sharav* days (very dry and hot days in spring and autumn). The shape of the daily transpiration curve was similar under all conditions. The transpiration rates of both types of sample were similar in the autumn. On ordinary summer days the transpiration of the potted plants was 25–35% lower than that of the detached leaves from grove trees, and on *sharav* days it was as much as 50% lower. On autumn days the trend in fluctation of water loss became apparent from the fourth minute after plucking, and later the rate of transpiration decreased and the stomata closed. On *sharav* and hot mid-summer days a sharp rise in transpiration was common, starting in the second minute after plucking and accompanied by opening of the stomata.—Dep. Hort., Hebrew Univ., Rehovot.

4064. Halevy, A.
Orange leaf transpiration under orchard conditions. V. Influence of leaf age and changing exposure to light on transpiration, on normal and dry summer days.
Bull. Res. Coun. Israel Sect. D Bot., 1956, **5**: 165-75, bibl. 33.

The daily transpiration curve of Shamouti orange leaves on a normal summer day generally showed 2 peaks of about the same height. On *sharav* days [see preceding abstract] the curve had 2 or 3 peaks, of which the first was the highest and occurred earlier than on normal days. On *sharav* days daily transpiration losses per unit of leaf surface were equal to, or more generally less than, those of normal summer days. Daily transpiration losses of shade leaves were always lower than those of sun leaves, but differences were smaller on *sharav* days than on normal days. A direct correlation was generally found between transpiration rates and stomatal aperture. Leaves were divided into 4 groups according to age and rates of transpiration.—Dep. Hort., Hebrew Univ., Rehovot.

4065. Caprio, J. M., Harding, R. B., and Jennings, R. F.
Orange fruit size and yield in relation to mean monthly temperatures in a California orchard.
Proc. Amer. Soc. hort. Sci., 1955, **66**: 45-56, bibl. 14.

A study was made, using polynomial repressions, of the effect of temperature and age of tree on size and yield of Valencia and Navel oranges in southern California [see also *H.A.*, 25: 2018]. Fruit size of both varieties decreased with increasing tree age. Yield increased with tree age to a maximum and then decreased. Warmer-than-average autumn and winter temperatures were associated with increased size of both Valencias and Navels. Cooler-than-average temperatures during spring and summer appeared to favour larger sizes for Valencias, whereas warmer-than-average temperatures during the entire period after bloom through the following winter appeared to favour larger sizes for Navel oranges. No effect of temperature on yield was apparent. Since mean monthly temperatures may be correlated with other factors, further studies are necessary to confirm these findings and to determine the effect of other meteorological elements on the orange crop.—Univ. Calif., Riverside. G.M.J.

4066. Cooper, W. C., Peynado, A., and Otey, G.
Effects of plant regulators on dormancy, cold hardiness, and leaf form of grapefruit trees.
Proc. Amer. Soc. hort. Sci., 1955, **66**: 100-110, bibl. 25, illus.

Auxins, anti-auxins and a number of other growth substances were applied in various concentrations in December to the leaves and roots of grapefruit trees growing in the field. 2,4-D had no appreciable effect on cambial activity, bud growth or cold hardiness, but it had formative and toxic effects. 2,4,5-T treatment resulted in a slight inhibition of cambial activity and a 1° F. increase in cold hardiness, but injury was severe. Very little inhibition of cambial activity was obtained with MH, Dalapon, amino triazole, sodium arsenate and CMU; many formative and toxic effects were observed. CIPC, HPC and BTHB were completely ineffective and non-toxic at the concentrations used. The formative effects observed for 2,4-D, 2,4,5-T, 2,4,5-TP, 2,4,6-T, MOPA, Sesin and Natrin were similar. The formative effects of 2,4-D, MH, Dalapon and amino triazole were distinctly different.—U.S. Dep. Agric. and Texas agric. Exp. Stat., Weslaco, and Rio Farms, Inc., Monte Alto, Texas.

4067. Toll Jubés, J., Taboada, V. L. E., and Oste, C. A.
Daños de las heladas sôbre los citrus en Tucumán: su recuperación. **(Frost injury to citrus in Tucumán: means of restoring the trees to health.)**
Circ. Estac. exp. agric. Tucumán **151,** 1955, pp. 14, illus.

A survey of the damage caused to citrus by the severe frosts of 1955 showed that lemons were the most severely affected and mandarins the least. The degree of damage varied greatly with locality but in general unhealthy and autumn-pruned trees suffered the most. The types of injury caused are described. Recommendations for the after-care of damaged trees include cutting back dead wood after new growth has begun, scraping away loosened bark and painting the wounds, whitewashing the trunks, irrigating, cultivating the soil to prevent weed competition and allow water penetration, applying a complete fertilizer and spraying with copper and zinc when the new leaves have developed.

4068. Tumanov, I. I.
Frost protection of citrus. [Russian.]
Izd. Akad. Nauk S.S.S.R., 1954, pp. 93, bibl. 34, illus., 1.50 roubles.

Following a discussion of the biological characteristics of citrus the agrotechnical methods which increase frost resistance and restore frost-damaged plantations are described. They include manuring, regulating the soil temperature and moisture by mulching and cover cropping, regulating growth through rootstocks and growth substances, controlling fruiting, hardening of plants and pruning. The development of frost-resistant varieties is mentioned, and then methods of frost protection by snow and tent coverings, orchard heating and smoke are discussed. In the last chapter the growing of lemons in trenches is described.

4069. Tumanov, I. I., and Smirnov, N. S.
Emergency winter heating of lemon plantations with flameless fuel and red phosphorus smoke. [Russian.]
Trud. Inst. Fiziol. Rast. Timiryazeva, 1955, **9**: 288-323, bibl. 17, illus.

A detailed description is given of experiments conducted in 1952 at Suhumi on frost protection of lemon plantations under the following headings: I. Heating citrus trees in the open, discussing types of heaters and fuel, firing, distribution of heaters, effectiveness of heating and economic considerations. II. Heating of lemon trees under cover. III. Trials on the protection of citrus with red phosphorus smoke. [For some results, published briefly earlier, see *H.A.*, 24: 766.]

Citrus—diseases and pests.

(*See also* 4060, 4127a, f, h, i, s, t, y, 4128b, c, o, 4131, 4273.)

4070. Rodney, D. R., and others.
Lemon tree collapse as related to sodium in roots.
Citrus Leaves, 1956, **36**(6): 8-9.
Calif. Citrogr., 1956, **41**: 313-15, 317, bibl. 3.

Sodium concentrations in lemon tree roots were relatively low when the trees were healthy. In the trees showing symptoms of collapse large increases in Na concentration were apparent, but this was a result, and not the cause, of their condition.

4071. Moreira, S.
Sintomas de "exocortis" em limoeiro Cravo. (**Symptoms of exocortis in Rangpur lime.**) [English summary ⅓ p.]
Bragantia, 1955, **14**: xix-xxi, illus.

Exocortis (scaly butt) of budded citrus is almost certainly a virus disease. Symptoms frequently develop when trifoliate orange or some of its hybrids are used as rootstocks. Unfavourable scions for these include Baianinha orange, Marsh Seedless grapefruit, Maracaña and Hamlin orange. Tops showing no symptoms on trifoliate stocks are Pera and Washington Navel oranges, Willow Leaf mandarin and Eureka lemon. Rangpur lime rootstocks [see also *H.A.*, 25: 4302] are similarly but less severely affected by the scions that produce symptoms on trifoliate orange.

4072. Bitancourt, A. A.
Estudos sôbre a leprose dos citrus. 1. Distribuição geográfica e sintomatologia. 2. Transmissão natural às folhas. 3. Transmissao natural às frutas. 4. Experiencias de tratamento. (**Studies on leprosis of citrus. 1. Geographical distribution and symptoms. 2. Natural transmission to leaves. 3. Natural transmission to fruits. 4. Control experiments.**) [English summaries pp. 1, 2, 1½, ½.]
Arq. Inst. biol. S. Paulo, 1955, **22**: 161-84, bibl. 54, illus.; 185-203, bibl. 9; 205-18, bibl. 7, illus.; and 219-31, bibl. 16, illus.

Leprosis or scaly bark is transmitted by the mite *Tenuipalpus pseudocuneatus*. Possible non-citrus hosts are mentioned and the wide variability of symptoms is discussed. In experiments in São Paulo state, young potted plants of 10 varieties of sweet orange were left for varying periods under diseased adult trees. Seleta was the most susceptible and Sabará was immune. Resistance was higher in young than in older leaves of Pera and Bahia. The leaf infection rate was higher between January and June than in other months. Covering of fruits for different periods with glass flasks showed that maximal fruit infection occurred shortly after the middle phase of their development. Protection of fruits by wire gauze cages was effective in approximate proportion to the fineness of the mesh. The crop immediately following very severe pruning was free from the disease but was greatly reduced in yield. The following crop was 3·6% affected as against 37·6% in unpruned trees. Copper fungicides in some instances increased fruit infection and gave a disease-percentage range of 6·7–34·2. Barium polysulphide and lime-sulphur sprays gave the best results with 1·3–12·7% disease compared with 1·0–15·3% for oil sprays and 10·8–37·6% for untreated trees.

4073. Wallace, J. M.
Tristeza disease of citrus, with special reference to its situation in the United States.
Plant Prot. Bull. FAO, 1956, **4**: 77-87, bibl. 46, illus.

The author summarizes the world literature and his own findings on tristeza disease under the following headings: history, economic importance, symptoms (collapse and decline of budded citrus trees and stem-pitting, but in California and Arizona the latter also occurs on trees not infected with the disease), insect vectors, the origin of the disease, varietal susceptibility, the diagnosis of infected trees and control measures.—Univ. Calif., Riverside. J.R.L.

4074. Sleeth, B.
Occurrence of tristeza in two citrus variety plantings.
J. Rio Grande Valley hort. Soc., 1956, **10**: 31-3, bibl. 3.

Of 268 citrus trees, among which tristeza-infected trees had grown for many years, only 12 were found to be carriers of the tristeza virus, and these were apparently infected by budding with buds from parent trees affected by tristeza. [From author's summary.]

4075. Olson, E. O.
Mild and severe strains of tristeza virus in Texas citrus.
Phytopathology, 1956, **46**: 336-41, bibl. 16, illus.

Citrus seedlings of 4 varieties were bud-inoculated with tristeza virus from field sources of Matsui or Sueoka satsuma mandarin and observed for 16 months. In comparison with tristeza virus from Matsui satsuma, that from Sueoka satsuma caused chlorosis and severe stunting of Mexican lime and Red Blush grapefruit seedlings and chlorosis and reduced growth of sour orange seedlings. It had no observed effect on Cleopatra mandarin seedlings. The symptoms on lime plants infected with virus from Sueoka satsuma were similar to, or identical with, the published descriptions of symptoms caused by a severe strain of tristeza virus in Brazil and other countries, where both mild and severe strains of tristeza virus occur. A mild strain of tristeza virus from a Meyer lemon tree inhibited the development of severe symptoms in lime plants bud-inoculated with virus from Sueoka satsuma; this inhibition continued for 14 months and is evidence that the virus causing severe symptoms on lime is related to the virus causing mild symptoms. The causal agents of cachexia, exocortis and psorosis did not inhibit the development of severe symptoms in limes bud-inoculated with virus from Sueoka satsuma; this is evidence that these viruses are not related to the virus causing severe symptoms of tristeza. [Author's summary.]—Texas agric. Exp. Stat., Weslaco.

4076. Costa, A. S., Grant, T. J., and Moreira, S.
Reação da laranjeira azêda à tristeza. **(Reaction of sour orange trees to tristeza.)** [English summary 1 p.]
Bragantia, 1954, **13**: 199-216, bibl. 26, illus.

Sour orange is easily infected by tissue union, but not by aphid vectors. It can be used as a rootstock for sour orange or lemon even when tristeza is present, but not for diseased sweet orange, which causes phloem degeneration. Lemon or sour orange buds grow satisfactorily on affected tops of sweet orange on sour orange rootstocks. It is of little or no benefit to induce shoot growth from sour orange rootstocks bearing tristeza-diseased sweet orange tops. Many citrus varieties can be tested for tristeza by budding on sour orange seedlings. Intergrafts as narrow as 3 cm. of sour orange between tops and rootstocks of sweet orange caused injury when tristeza developed. Injury from tristeza was less from multiple than from single unions between sweet orange buds and sour orange stocks.

4077. Moreira, S., Costa, A. S., and Grant, T. J.
Métodos para identificação e contrôle da tristeza dos citros. **(Methods for identification and control of tristeza in citrus.)** [English summary $\frac{3}{4}$ p.]
Bragantia, 1954, **13**: 223-36, bibl. 18, illus.

Features distinguishing tristeza from foot-rot are described. Lists of susceptible and resistant stock-scion combinations are given and the distinguishing characteristics of the principal rootstocks are described. Histological and transmission tests are briefly discussed. Control is effected by indirect methods. Resistant stock-scion combinations and in some cases unbudded trees from nucellar embryos are used for new plants. In established orchards the choice between complete and partial replacement of trees depends on the rate of spread of the disease by insect vectors and on the virulence of the tristeza strain. Inarching, rooting of scions or top working with lemon may be carried out where suitable. Quarantine measures are important.

4078. McClean, A. P. D.
Tristeza and stem-pitting diseases of citrus in South Africa.
Plant Prot. Bull. FAO, 1956, **4**: 88-94, bibl. 8, illus.

In South Africa sweet oranges do not seem to be affected by tristeza disease, probably because rough lemon is used as a rootstock; grapefruit trees show a tendency to decline early on any rootstock; tangerine trees budded on rough lemon have a commercial life of 10–12 years, but often live longer when grown on their own roots; and Eureka lemons on rough lemon also tend to decline prematurely. Sour orange has proved a poor stock for sweet orange, tangerine or grapefruit but with some varieties of lemon quite good trees are formed. The nature of the virus disease is discussed. Various ways of overcoming the disease are suggested including the production of nucellar seedlings and the possibility of immunization with mild strains of the disease.—Dep. Agric., Pretoria.

J.R.L.

4079. Wallace, J. M., and others.
The tristeza virus in Israel.
Phytopathology, 1956, **46**: 347, bibl. 4, illus.

The presence of the tristeza virus has been demonstrated in Israel on Meyer lemons, the parent of which was imported from California in 1932. This is thought to be the first experimental proof of tristeza in the Mediterranean region. All Meyer lemons in Israel are being destroyed to remove the source of infection.—Univ. Calif., Riverside, and Agric. Res. Stat., Rehovot.

4080. Reichert, I., Bental, A., and Yoffe, I.
Transmission experiments on the tristeza and xyloporosis diseases of citrus.
Ktavim, 1956, **6**: 69-75, bibl. 9, illus.

No leaf symptoms developed on Palestine sweet lime seedlings, which were graft- and aphid-inoculated from xyloporosis- and suspected tristeza-affected sources; observations are being continued for the possible appearance of wood-pitting symptoms. Mexican lime seedlings graft-inoculated from 3 Meyer lemon sources developed leaf symptoms characteristic of tristeza, thus confirming the presence of the tristeza virus in Meyer lemons in Israel. On the other hand Mexican lime seedlings developed no tristeza symptoms when inoculated by *Aphis gossypii* or *Toxoptera aurantii* or when grown under infected Meyer lemon trees. This may indicate that there has not so far been any natural spread of tristeza in Israel.—Agric. Res. Stat., Rehovot.

4081. Reichert, I., Bental, A., and Yoffe, I.
On the problem of the identity of "little leaf" and "xyloporosis" diseases.
Ktavim, 1956, **6**: 77-82, bibl. 8, illus.

Trees of 19 varieties of citrus, all budded on Palestine sweet lime stock and all infected with xyloporosis, not only showed the wood pitting characteristic of xyloporosis but also bore lopsided fruits—a symptom hitherto thought to be peculiar to trees budded on sour orange and attacked by little-leaf disease. It is concluded that the two diseases are identical.—Agric. Res. Stat. Rehovot.

4082. WINOCOUR, E.
The anatomy and histology of healthy and xyloporosis-affected Palestine sweet lime rootstocks budded to Shamouti sweet orange.
Bull. Res. Coun. Israel Sect. D Bot., 1956, **5**: 125-42, bibl. 27, illus.

The relationship between anatomical abnormalities and foliage decline in the scion are discussed, and it is suggested that the alterations to both wood and bark may be responsible for tree decline. In young rootstocks an abnormality of the outer bark may be a guide to diagnosis in the nursery.—Agric. Res. Stat., Rehovot.

4083. REICHERT, I., AND CHORIN, M.
Mal secco of citrus in Israel and neighbouring countries.
Bull. Res. Coun. Israel Sect. D Bot., 1956, **5**: 176-80, bibl. 13, illus.

Isolations from wood freshly infected with mal secco gave pure cultures of *Deuterophoma tracheiphila*, whereas *Colletotrichum gloeosporioides* as well as *Deuterophoma* were isolated from older infections. Conditions favourable for the disease are temperatures below 30° C., and high humidity. The use of windbreaks and grafting on an orange stock will reduce infection. Summer pruning and the use of resistant lemon varieties are also recommended.—Agric. Res. Stat., Rehovot.

4084. SATTAR, A., AND QUDDUS, Q. A.
Further studies on citrus withertip.
From abstr. in *Proc. 6th Pakistan Sci. Conf., Karachi, 1954, Part III*, pp. 107-9.

Investigations at the Agricultural College, Lyallpur, have shown that *Colletotrichum gloeosporioides* cannot attack citrus plants under normal conditions of growth. Withertip disease is caused by the attack of the fungus on plants in which vigour has previously been lowered by certain unfavourable conditions, including (1) high concentrations of salts in the root zone, (2) root disease due to other fungi, (3) inadequate nutrition or moisture, and (4) injury by frost or certain insects. Citrus plants were found to be susceptible to withertip disease in the following order: Sangtara orange, Kaghzi lime, Malta orange, grapefruit and sweet lime.

4085. RIVNAY, E.
Studies on the control of the fruit fly in Valencia orange groves in Israel.
Ktavim, 1956, **6**: 101-9, bibl. 4.

Where small Valencia groves are surrounded by Jaffa oranges, which have been sprayed in October, the Valencias will also be protected against the Mediterranean fruit fly until mid-April. Winter treatment of Valencias is unnecessary, because the fruit is resistant at this season, but the trees should always be treated in March, even when in blossom, with dieldrin, methoxychlor or DDT. Where picking is postponed until the end of April or later a second application is essential. Other points discussed include the use of traps to determine fly activity and the safeguarding of bees and other beneficial insects.—Agric. Res. Stat., Rehovot.

4086. SPENCER, J. L., CABANILLAS, E., AND KENNARD, W. C.
Incidence and control of the citrus hesperiid in Puerto Rico.
Plant Prot. Bull. FAO, 1956, **4**: 61-3, bibl. 1, illus.

A single application of DDT spray at a concentration of 1 lb. of active ingredient in 50 gal. of water per acre, using a wetting agent, gave excellent control of caterpillars of *Achylodes papinianus minor*, when applied to 10-year-old infested trees at 2 pints per tree.—Fed. Exp. Stat., Mayagüez.

4087. ELMER, H. S., AND JEPPSON, L. R.
Citrus flat mite on increase.
Calif. Agric., 1956, **10**(6): 17-18, illus.
Biology and control of citrus flat mite.
Citrus Leaves, 1956, **36**(6): 12, 31, illus.
Biology, control of citrus flat mite.
Calif. Citrogr., 1956, **41**: 311-12, illus.

The increase in flat mite (*Brevipalpus lewisi*) infestation is correlated with reductions in the use of sulphur, lime-sulphur or oil spray applications. The mite is most economically controlled by sulphur applied as a preventive treatment during the late winter or spring. Chlorobenzilate may be used at times when it is not advisable to apply sulphur.

4088. SPENCER, H., AND SELHIME, A. G.
Sampling of infestations of citrus red mite.
Citrus Mag., 1956, **18**(9): 11, bibl. 1.

A method is described of sampling citrus red mite populations in the field with a hand lens that a grower could use to decide when to spray. J.R.L.

4089. SWIRSKI, E.
Experiments in controlling citrus rust mite (*Phyllocoptruta oleivora* Ashm.).
Ktavim, 1956, **6**: 91-9, bibl. 3.

A sulphur spray, with or without the addition of zinc sulphate, was more effective than a sulphur dust, with or without zinc oxide, but dusting is generally to be preferred on economic grounds. Among other acaricides diazinon gave better control than Chlorobenzilate, Fosferno or Aramite. Citronol and Shell White Oil Spray "A", with or without malathion or Fosferno, were unsatisfactory, but the white oil plus diazinon gave good control for 22–25 days.—Agric. Res. Stat., Rehovot. [See also abstract 4055.]

4090. LATIF, A., AKMAL, M. M., AND KHAN, J. K.
"Systox" as a contact and systemic insecticide against citrus psylla.
From abstr. in *Proc. 6th Pakistan Sci. Conf., Karachi, 1954, Part III*, pp. 48-9.

Citrus psylla (*Diaphorina citri*) is the most serious pest of citrus in the Punjab. Systox at 0·05% was applied to 10- to 15-year-old trees both as spray on the leaves and through irrigation water to the roots. Spraying gave 100% kill of the nymphs and adults within 24 hours, whereas the irrigation method did not show encouraging results. Sprayed plants remained free of the pest for 2–3 weeks. Systox did not kill the eggs, but the nymphs emerging from them did not survive.—Punjab agric. Coll., Lyallpur.

4091. Latif, A., Muhammad, W., and Ghani, M. A.
Utilization of *Coccinella septempunctata* (L. Coleop: Coccinellidae) for the control of citrus psylla (*Diaphorina citri* Kuw.).
From abstr. in *Proc. 6th Pakistan Sci. Conf., Karachi, 1954, Part III*, p. 52.

Within 21 days of its release *C. septempunctata* reduced the infestation of citrus psylla nymphs and adults by 84·7% and 76·3% respectively.

4092. Carman, G. E.
Field evaluation of malathion for control of California red scale on citrus.
J. econ. Ent., 1956, **49**: 103-11, bibl. 12.

From the results of preliminary field tests with malathion against California red scale, *Aonidiella aurantii*, on citrus it is concluded: (1) that malathion can be used effectively for the control of light and moderate infestations, provided that dosages generally in excess of 2 lb. 25% wettable powder per 100 gal. are applied during the immediate post-bloom period; (2) that it can be used effectively in combination with either parathion or various grades of petroleum oil; and (3) that as used in these studies it is relatively non-phytotoxic and is not instrumental in contributing to the post-treatment increase of insect or mite populations against which it is largely ineffective. [From author's summary and conclusions.]—Univ. Calif., Riverside.

4093. Allman, S. L.
Insect pests. Summary of applied and biological control results in treatment of red scale and Queensland fruit fly.
Citrus News, 1956, **32**: 44-5.

Summer fumigation with HCN gas was the most effective single treatment for red scale control. For heavy infestations of red scale the following schedules have been satisfactory: (*a*) skeleton spray of white oil 1/40, followed by summer fumigation; (*b*) 0·1% parathion or 0·2% malathion followed by white oil 1/40 in summer; (*c*) white oil 1/40 in summer followed by 0·1% malathion or 0·05% parathion in late summer. Biological control of red scale or fruit fly in New South Wales is not yet of importance. A weekly spray schedule with L 13/59 starting at 0·1% followed by one or more sprays at 0·05% gave satisfactory control of fruit fly in late peaches. Metasystox induced an off-flavour in the fruits and diazinon gave poor control. In winter main-crop citrus fruits an ovicidal substance was found in the oil glands. The pith of Eureka lemon and of Navel and Valencia oranges did not encourage the development of newly-hatched fruit fly larvae, but this did not apply to Wheeney grapefruit or to old second-crop Valencias.

4094. Birchfield, W., and Bistline, F.
Cover crops in relation to the burrowing nematode, *Radopholus similis*.
Plant Dis. Reptr, 1956, **40**: 398-9, bibl. 2.

Crotalaria spectabilis and *C. striata* did not allow the reproduction and survival of the burrowing nematode in inoculation experiments. It is suggested that *Crotalaria* would be a more desirable cover crop for citrus areas cleared and treated for control of spreading decline than the more commonly used *Indigofera hirsuta*, which proved to be a favoured host of the nematode.—St. Plant Board Fla, and Minute Maid Corp.

4095. Martin, J. P., Helmkamp, G. K., and Ervin, J. O.
Effect of bromide from a soil fumigant and from $CaBr_2$ on growth and chemical composition of citrus plants.
Proc. Soil Sci. Soc. Amer., 1956, **20**: 209-12, bibl. 10, illus.

A study was made to determine the influence of soil Br from $CaBr_2$ treatments or from preplanting fumigation of soil with ethylene dibromide on growth and chemical composition of citrus plants. The treatments did not affect the percentages of Ca, Mg, K, Na or P in the plants. Preplanting fumigation with ethylene dibromide or treatment with $CaBr_2$ reduced growth of citrus seedlings, whereas fumigation with ethylene dichloride or treatment with $CaCl_2$ exerted little or no influence. In one soil citrus leaf Br concentrations of 0·17, 0·33, 0·40, 1·3 and 1·8% were associated with 12, 22, 31, 57 and 90% reduction in growth, respectively. In two soils certain citrus leaf Br concentrations originating either from soil $CaBr_2$ applications or pre-treatment of the soil with ethylene dibromide fumigant were associated with comparable growth retardation. Carrot and lima bean plants grown for comparison were much more tolerant to Br than were citrus plants. A leaf concentration of 2·5% Br did not reduce growth of carrots. Lima beans tolerated 1·5% or more leaf Br, while 0·2% was sufficient to reduce growth of citrus plants. [Authors' abstract.]—Calif. Citrus Exp. Stat., Riverside.

Citrus—fruit composition, handling and storage.

(*See also* 3391, 4127w, 4128a, h, i.)

4096. Rygg, G. L., and Getty, M. R.
Seasonal changes in Arizona and California grapefruit.
Tech. Bull. U.S. Dep. Agric. **1130**, 1955, pp. 44.

Marsh grapefruit was collected throughout 3 seasons in Arizona, in the desert regions of S. California (maturing in winter and spring) and in southern foothill groves of California (maturing in summer and autumn). Measurements were made of the weight, diameter, rind thickness, core diameter and juice content of the fruit; colour, texture and palatability were noted; and analyses were made of ascorbic acid, total soluble solids, total acids, insoluble solids, total pectic substances and naringin. The best test of maturity tried was the present standard based on the ratio of total soluble solids to total acid; but it is suggested that a higher standard would be desirable. Grapefruit from trees sprayed with arsenical washes had slightly better quality than that from unsprayed trees but not sufficiently so to be of any practical commercial significance.
J.R.L.

4097. Cohen, A.
The effect of different factors on the ascorbic acid content in citrus fruits. II. The relationship between species and variety and the ascorbic acid content of the juice.
Bull. Res. Coun. Israel Sect. D Bot., 1956, **5**: 181-8, bibl. 11.

The vitamin C content of the juice of 62 varieties of 4 citrus species was determined. Oranges generally had a higher, and mandarins a lower, content than grapefruit or lemons. It was noted in many cases that taxonomically-related varieties had similar contents. Lemon tests have indicated that proper bud selection might improve the vitamin C content of the juice. With oranges the Baladi variety, appearing as a bud-mutation on Shamouti trees, is richer in ascorbic acid than Shamouti.

4098. Prosser, D. S., Jr., and others.
Bulk handling of fresh citrus fruit.
Tech. Bull. Fla agric. Exp. Stats **564**, 1955, pp. 35, bibl. 3, illus.

Three variations of the system of bulk handling fresh fruit in packing houses are presented. These methods are more satisfactory than the standard method, because the field box is eliminated in most cases and the labour needed is less and can work more efficiently under easier conditions. In addition, sorting the fruit before it enters the degreening rooms makes better use of space and gives higher cannery returns, washing and control of decay are easier, and the cost of handling is greatly reduced. J.R.L.

4099. Young, R. E., and Biale, J. B.
Carbon dioxide fixation by lemons in a CO_2 enriched atmosphere.
From abstr. in *Plant Physiol.*, 1956, **31** (Suppl.): xxiii.

Lemons were stored in CO_2 until the O_2 uptake was increased and then subjected to $C^{14}O_2$ for 24 hours. Substantial fixation resulted and the activity was about the same in both pulp and rind; most of the activity occurred in the acids. The results suggest the participation of malic enzyme and acetyl-Co A in the metabolic processes of lemon fruit.—Univ. Calif., Los Angeles.

4100. Eaks, I. L.
The physiological breakdown of the rind of lime fruits after harvest.
Proc. Amer. Soc. hort. Sci., 1955, **66**: 141-5, bibl. 4.

Two distinct types of breakdown were shown to occur, namely oil-gland injury (oleocellosis) and chilling injury (surface pitting). Oleocellosis was found to be associated with bruising and usually appeared within a week after harvest as brown-to-black discoloration and breakdown. The more turgid the fruit when handled, the more susceptible it was to oil-gland injury. Surface pitting was caused by prolonged storage at low temperatures and showed as leathery, brown, sunken areas in the rind. The limit of safe storage at 40° F. (commercial storage temperature) was about 4 weeks. Fruit held at 50° F. did not develop pitting but began to turn yellow after 2–3 weeks in store. In preliminary tests a coating of pharmaceutical mineral oil prevented yellowing for at least 4 weeks at 50° F.—Univ. Calif., Riverside.

4101. Gutter, Y.
The influence of growth regulators on the keeping quality of stored Clementines.
Ktavim, 1956, **6**: 119-23, bibl. 3.

Dipping Clementines in 2,4-D at 100 or 500 p.p.m. or in 2,4,5-T at 50 or 200 p.p.m. reduced rots, mainly stem-end rot, by 55 to 80% during 6 and 9 weeks' storage. With 2,4,5-T 10 sec. dips were better than 3 min. dips but the reverse was true of 2,4-D. Both growth substances delayed ageing of the fruit and reduced the number of black buttons. Combined treatment with growth substances and diphenyl wraps was more effective than using growth substances alone; it reduced rots to 2·5% or less after 9 weeks' storage, but the flavour of the juice was impaired.

4102. Littauer, F. S.
Combined versus single treatments for the control of citrus fruit rots.
Ktavim, 1956, **6**: 129-33.

The following 3 treatments were applied to Shamouti and Valencia oranges singly, in pairs or all three together: (i) wrapping in diphenyl wraps, (ii) borax dip followed by waxing, and (iii) gassing with nitrogen trichloride. The paired treatments were very effective in controlling moulds and stem-end rots during 4–5 weeks' storage at 18–20° C., their advantage over single treatments being especially marked with Shamouti oranges. The 3 treatments combined were sometimes, but not always, slightly better than combinations of 2 treatments.—Agric. Res. Stat., Rehovot.

4103. Hopkins, E. F., and Loucks, K. W.
Value of Dowicide A-hexamine treatment in the cold storage of oranges.
Citrus Mag., 1956, **18**(10): 16-20, bibl. 9, illus.

In 10 trials Valencia and Pineapple oranges were treated with Dowicide A–hexamine, as described earlier [*H.A.*, 25: 3222], and were then packed in untreated cartons or boxes and stored for 8 or 10 weeks at 40° F. By comparison with untreated fruit the treatment in all cases reduced decay by 91 to 94%. When fruit was removed from storage and held for 3 or 7 days at 70° F. there were appreciable increases in decay, but the treated fruit continued to show markedly less decay than the untreated. There were no significant differences in the amount of decay between fruit stored in unventilated, fibreboard cartons and fruit stored in standard wire-bound boxes.

4104. Eaks, I. L.
Effects of biphenyl on respiration of oranges and lemons.
Proc. Amer. Soc. hort. Sci., 1955, **66**: 135-40, bibl. 10.

A small but significant increase in respiratory rate was observed for both oranges and lemons in the presence of biphenyl vapour. The use of biphenyl apparently did not influence the gross chemical composition of the juice during experimental periods of up to 14 days.—Univ. Calif., Riverside.

4105. Zukerman, I., and Nadel-Schiffmann, M.
Influence of fresh or irradiated limonene on fungi causing citrus fruit rots.
Ktavim, 1956, **6**: 125-7, bibl. 1.

Fresh limonene from orange essential oil had no effect on cultures of 11 fungi causing citrus fruit rots, but irradiated limonene inhibited all the fungi, the lethal dose ranging from 150 to 1,700 p.p.m. The organisms most sensitive to irradiated limonene were 2 *Phytophthoras*, and preliminary trials with oranges have shown that the percentage of rot caused by these fungi can be considerably reduced if limonene treatment is carried out within 24–48 hours of inoculation.—Israel Inst. biol. Res., Nes Ziona, and Agric. Res. Stat., Rehovot.

4106. Rougieux, R.
Penicillium et agrumes. (***Penicillium* and citrus fruits.**)
C.R. Acad. Agric. Fr., 1956, **42**: 329-30.

In attempts in Algeria to control infection by *Penicillium italicum* and *P. digitatum* of stored oranges and lemons it was found that antibiotics tended to decrease in effectiveness with time, and that altering the pH of coatings had little effect on infection. To control the fungus and prevent loss of weight the following order of operations is suggested: washing, careful brushing, dipping in fungicide solution, drying, coating with paraffin or vegetable wax containing a fungicide, polishing.

4107. Rougieux, R.
Action des substances colorantes sur le genre *Penicillium*. (**Action of dyes on the genus *Penicillium*.**)
C.R. Acad. Agric. Fr., 1956, **42**: 354-5.

In tests on a large number of dyes as possible fungicides for stored citrus fruits, the following showed high activity and will be further investigated: methyl violet, malachite green, rhodochrome, brilliant green and auramine.

4108. Klotz, L. J., and Roistacher, C. N.
Nature and control of blue-green mold infection in citrus fruits.
Citrus Leaves, 1956, **36**(7): 6-8, 26, bibl. 2, illus.
Blue-green mold in citrus fruit.
Calif. Citrogr., 1956, **41**: 356, 364-6, bibl. 2, illus.

Penicillium digitatum and *P. italicum* can only infect citrus fruits through a surface injury. The tetrazolium dye test applied to lemons has shown a 5- to 6-fold increase in number of injuries during picking operations. Little additional injury occurs during transport from field to packing house, but further injuries occur when the fruits are graded and placed in storage boxes. Finally, during the packing and handling of cartons there may be a 4-fold increase in injuries. This emphasizes the need for a volatile fungicide or fungistat in contact with the packaged fruit, and this must be applied very soon after a freshly-made wound becomes inoculated, especially if temperatures are high. Methods of minimizing losses from blue and green moulds are summarized.

4109. (Boyce, A. M.)
New method for preventing fruit decay.
Calif. Citrogr., 1956, **41**: 288.
New mold control developed by U. of C.
Citrus Leaves, 1956, **36**(7): 16.

A mixture of salts [unspecified] which will produce ammonia when moistened, prevented the development of fruit moulds when added to citrus cartons. The use of impregnated sheets within the cartons is probably preferable for commercial purposes than the distribution of small pellets.

4110. Nadel-Schiffmann, M.
The use of pre-harvest copper sprays to control *Phytophthora* rot in citrus fruit.
Ktavim, 1956, **6**: 111-17, bibl. 7.

Pre-harvest sprays of ½% Perenox and 1% bordeaux markedly reduced the incidence of brown rot, caused by *Phytophthora citrophthora*, *P. parasitica* and *P. hibernalis*, in fruits of 3 citrus species, both on the trees and when they were stored for 3–4 weeks at 18° C.—Agric. Res. Stat., Rehovot.

Dates.

(*See also* 4127j, 4128k.)

4111. Munier, P.
Possibilités et avenir de l'extension de la culture du palmier-dattier dans les confins Saharo-Soudanais d'A.-O.F. et d'A-E.F. (**Possibilities and future of the extension of date palm cultivation within the Sahara-Sudan boundaries of French West Africa and French Equatorial Africa.**)
Fruits d'Outre Mer, 1956, **11**: 162-7, map.

The positions of date plantations are given on a climatic map of the region. In French West Africa date palms do not flower at temperatures below 22·5° C. Important factors for success are (1) the choice of areas where harvesting can be completed before the rainy season sets in and (2) the systematic study and selection of varieties. Possibilities of extension are very limited in the Sahara climatic region, mainly owing to poor water resources. Regions of climate intermediate between Saharan and Sahelian, or between Sahelian and Sudanese offer good prospects. An experimental station for dates has been opened at Kankossa (Mauretania).

4112. Haas, A. R. C., and Brusca, J. N.
Nutrition of date seedlings.
Calif. Agric., 1956, **10**(8): 11, illus.

Nutritional studies were carried out with Deglet Noor seedlings in sand and soil cultures. With increasing levels of calcium nitrate the percentages of Ca in the dry matter of leaflets and roots increased, those of Mg and total P in the leaflets also tended to increase and that of K in the roots tended to decrease. The effect of phosphate was marked and the total P content in leaflets and roots increased as P_2O_5 levels were increased. The best top growth, with excellent root growth, was made at 93 p.p.m. P_2O_5. A level of 94·5 p.p.m. of Na also resulted in excellent top growth. Other tests indicated that chloride may stimulate growth of Deglet Noor seedlings. Sodium chloride applications to seedlings in small undrained soil cultures resulted in improved growth.

Litchis.

(*See also* 4032.)

4113. Nelson, R. O.
Comments on lychee propagation—air layering and graftage.
Proc. Fla Lychee Grs' Ass., 1954, **1**(1): 8-11, from *Biol. Abstr. Sect. D*, 1956, **30**, No. 14688.

Litchi marcots were rooted in 2 weeks shorter time by using vinyl films of thickness ranging from 0·001 to 0·0025 in. for wraps rather than the heavier gauge 0·0035 in. more commonly used. Care must be exercised to remove these layers when roots first appear to prevent excessive drying out of the moss and rootlets, which is apt to occur when using films of greater permeability. Hardening the rooted marcots under an intermittent water mist, regulated by a timer and solonoid valve, provided an environment in which plant losses were negligible. Grafting by several methods was successful using scions from vigorous growth flushes still showing green colour on the stem.—Univ. Miami, Coral Gables, Fla.

4114. Young, T. W.
Fertilization of the lychee on sandy and loamy soils.
Proc. Fla Lychee Grs' Ass., 1954, **1**(1): 11-14, from *Biol. Abstr. Sect. D*, 1956, **30**, No. 14700.

Data obtained by survey indicate that the irregular flowering and fruiting of litchis in Florida are not controlled appreciably by manipulation of fertilizer. Cold-induced dormancy shortly before bloom apparently does promote flowering. A balanced fertilizer 2 or 3 times a year maintains vegetative vigour in bearing trees. On old citrus soils P and Cu may be omitted from the fertilizer.—Sub-trop. Exp. Stat., Univ. Fla.

Olives.

(*See also* 3340, 3341, 4127d, k, n, v, 4128d.)

4115. Jacoboni, N.
L'innesto ad anello e a penna nell'olivo. **(Ring-budding and bark-grafting in the olive.)**
Ann. Fac. Agrar. Perugia, 1954, **10**: 90-108, bibl. 23, illus.

When the olive variety Dolce Agogia was either ring-budded or bark-grafted on to shoots of wild olive arising from ovuli all the subsequent shoots which developed from exogenous adventitious buds on the ring of bark and from deep-seated normal buds and exogenous adventitious buds on the budwood showed the characters of the scion. Union was slower in bark-grafting; ring-budding, moreover, is less likely to result in tissue necrosis and, it is suggested, offers an easy method of converting to profit the vast areas at present covered by wild olive trees.—Ist. Colt. arbor. Univ. Perugia.

4116. Anagnostopoulos, P. T.
Vernalization of the olive tree and the germination of olive seeds. [Greek.]
From English synopsis of paper communicated to *Mtg biol. Soc. Athens*, 30 April, [1956?], pp. 2.

Vernalization of olive shoots, resulting in the differentiation of flower buds, occurred when the average temperature during December and January was 7°–15° C., with a minimum temperature of −2·5° to −1·0° C. Vernalization did not occur at an average temperature of 14°–18° C. When the minimum temperature in December was −0·8° C. some varieties required a minimum January temperature below 0° C. for vernalization whereas others did not. The latter produced male flowers when kept at 14–18° C. during January. Varieties requiring a minimum January temperature below 0° C. could be vernalized by subjecting them for a month during July or August to dry conditions and high temperatures (about 28° C.), followed by irrigation. Seed taken from half-ripe fruit before November and sown immediately germinated in 40–50 days, but seed taken from ripe fruit did not germinate until the following year when dormancy had been broken by high summer temperatures.—Sup. Coll. Agric., Athens. [See also *H.A.*, 26: 2136.]

4117. Briccoli Bati, M.
Considerazioni sulla ripresa dell'olivo in Umbria dopo le gelate del 1929. **(The recovery of olive trees in Umbria after the frosts of 1929.)**
Ann. Fac. Agrar. Perugia, 1954, **10**: 124-32.

A comparison between the yields before 1929 and in 1951/52 showed that the most frost-susceptible olive varieties, including the well-known Frantoio and Moraiolo, made the most rapid and complete recovery from frost injuries received in 1929. Environmental conditions most conducive to injury, e.g. south and south-east slopes, are normally satisfactory for recovery. That fact combined with the quick growth of the more tender varieties explains this phenomenon.

4118. Anagnostopoulos, P. T., Chryssoheris, F. P., and Bathis, E. S.
The effect of salts in the soil and irrigation water on the growth of olive trees. [Greek.]
[*Publ.*] *Superior School Agric., Athens*, 1955, pp. 9.

In an experiment to determine the relative resistance of different olive varieties to high salt concentrations, irrigation water was applied at a total annual rate of 2,750 tons per ha., supplying 2,657 kg. NaCl per ha. The responses of 29 varieties are tabulated, Gaidourolea being the most susceptible. Data are given on the nutrient composition of healthy and damaged leaves. It is concluded that there are varietal differences in susceptibility to high salt concentrations, and that healthy wood with a balanced C/N ratio is more resistant to damage than wood high in carbohydrates.

4119. Uriu, K.
Pistil abortion of the olive.
Calif. Agric., 1956, **10**(7): 13-14, illus.

Removing leaves from fruiting olive twigs always reduced the number of perfect flowers. The reduction became more marked as more leaves were removed, but some normal flowers were still produced after complete defoliation.

4120. Zito, F., and Spina, P.
Come germina il polline dell'olivo. **(The germination of olive pollen.)**
Ital. agric., 1956, **93**: 415-25, bibl. 45, illus.

The results of experiments at Catania between 1953 and 1955, using van Tieghem's hanging drop and Belling's creeping technique, are here set out. Pollen from 10 varieties of olive were used, and various solutions. The most striking conclusions reached are that: Saccharose solutions are preferable to glucose, a 15% saccharose solution being the best; the Belling method is much more successful than the van Tieghem; a trace of boric acid in the solution is advisable; with the Belling method the use of 2% agar is advisable; the addition of fragments of stigma, though adding to the danger of contamination, is otherwise helpful; the optimum temperature is 25° C.; in a given variety amount of pollen produced would appear to be correlated with viability; and each olive variety is found to possess a definite pollen germination capacity irrespective of culture medium and temperature.

4121. Jacoboni, N.
Oleosità delle olive di ramo "anulato". **(Oil content of olives from a ring-barked branch.)**
Ann. Fac. Agrar. Perugia, 1954, **10**: 109-12, illus.

Ring-barking, practised in the course of rejuvenation, is carried out shortly before flower bud differentiation, which takes place 60–70 days before anthesis. It increases fruit set but slightly reduces the oil content of the fruit.

4122. de Azevedo, A. R.
Ensaio comparativo da acção do parathion, diazinon e do malathion contra as larvas do *Dacus oleae*. **(Comparative trials with parathion, diazinon and malathion for control of *Dacus oleae* larvae.)** [English summary 1 p.]
Agron. lusit., 1956, **18**: 75-82, bibl. 2.

The 3 insecticides were used as aqueous emulsions at concentrations of 0·3 and 0·6% active material and were applied on 23 September and 13 October. No treatment gave more than 70% kill of olive fly larvae, parathion being the best and malathion being quite unsatisfactory.—Estac. agron. nac., Sacavém.

4123. Beingolea G., O.
Estatus actual de la plaga de la quereza negra del olivo (*Saissetia oleae* Bern) en los valles de Yauca e Ilo. **(Present state of the olive black-scale (*Saissetia oleae*) in the Yauca and Ilo valleys.)**
Inf. mens. Estac. exp. agríc. La Molina, 1955, **29**(341): 1-5, bibl. 2.

High humidity and poor drainage favour black scale. Neither lime-sulphur nor mineral oils were effective against it. Except in badly drained areas and on old and unhealthy trees, successful biological control was achieved by introducing the parasitic wasps, *Metaphycus lounsburyi*, *Scutellista cyanea* and *Lecanobius utilis*. In one locality these measures were supplemented by restricting irrigation and by introducing the predators *Periscopus californicus* and *Chrysopa* spp. *M. lounsburyi* was the most active control agent. The combination of biological control with application of parathion is briefly discussed.

Passion fruit.

4124. Pruthi, J. S., and Lal, G.
Refrigerated and common storage of purple passion fruits (*Passiflora edulis* Sims.).
Indian J. Hort., 1955, **12**: 204-11, bibl. 8, illus.

Ripe passion fruit kept most satisfactorily for 4–5 weeks at 42–45° F., when weight losses were at a minimum and no low temperature injury was observed. Weight losses were markedly reduced by packing the fruits in polythene bags or coating them with paraffin wax. Among fungi causing spoilage in storage *Penicillium* spp. were the most injurious. Formaldehyde (2%), iodine (2%), boric acid (5%) and alcohol (95%) were the most effective materials tested as dips for preventing spoilage. By washing the storage crates in 2–4% lysol solution fungal attacks were prevented for 5 weeks at 42–45° F.—Centr. Food tech. Res. Inst., Mysore.

Persimmons.

(*See also* 3490, 4128j.)

4125. Uehara, M.
Studies on micrometeorology in sloping orchards. 2. [Japanese, with English summary 1¼ p.]
J. hort. Ass. Japan, 1956, **25**: 17-34, bibl. 16, illus.

Data are given on temperature measurements made above and below soil level over a period of 3 years in a persimmon orchard on a south-west slope, an orange orchard on a north-east slope and a vineyard on a north slope. Temperature was closely correlated with the amount of insolation. The effect of windbreaks on temperature distribution was also observed. [For Part 1, see *H.A.*, 26: 1390.]

4126. Matsui, S., Ito, S., and Murata, N.
Relationships between chemical constituents and quality in dried persimmons. (1) Chemical constituents and qualities of the products prepared from several varieties. [Japanese, with English summary ⅓ p.]
J. hort. Ass. Japan, 1956, **25**: 49-53, bibl. 11.

Sweetness was dependent on total sugar content. The 10 varieties studied were almost equal in content of crude fibre and total pectin, but varied considerably in soluble pectin. The average fructose: glucose ratio was 1: 0·89 in the pulp and 1: 6·15 in the powdery surface deposit of the dried products.

Noted.

4127.

a Ayers, E. L.
Spreading decline in Florida citrus groves and ornamental plantings.
J. Rio Grande Valley hort. Soc., 1956, **10**: 169-77.
Over 120 species believed to be hosts of *Radopholus similis*.

b Breviglieri, N.
L'agrumicoltura negli Stati Uniti con particolare riguardo a quella della California e della Florida. **(Citrus growing in the United States with special reference to California and Florida.)**
Ital. agric., 1956, **93**: 282-326, bibl. 2, illus.

c Burke, J. H.
Citrus industry of Surinam.
Foreign Agric. Rep. U.S. Dep. Agric. **89**, 1956, pp. 24, illus.
Cultural conditions, expanding production, costs and quality problems.

d Burke, J. H.
Olive industry in Lower California, Mexico.
Foreign Agric. Rep. U.S. Dep. Agric. **85,** 1955, pp. 17, illus.
Where high winter temperatures and insufficient water are problems.

e Cooper, W. C., and Maxwell, N.
The search for avocado varieties adapted to the Rio Grande Valley.
J. Rio Grande Valley hort. Soc., 1956, **10**: 126-33, bibl. 21.
Work on salt- and frost-tolerant varieties reviewed.

f Costa, A. S.
Present status of the tristeza disease of citrus in South America.
Plant Prot. Bull. FAO, 1956, **4**: 97-105, bibl. 41, illus.
A review of research work.

g Cuscianna, N.
Evoluzione dei sistemi e dei mezzi per la lotta contro la formica Argentina (*Iridomyrmex humilis* Mayr.). Parte I. **(Development of methods of control of the Argentine ant, *Iridomyrmex humilis*. I.)** [English summary $\frac{1}{3}$ p.]
Ann. Sper. agrar., 1956, Vol. **10**, No. 3, Suppl. pp. lxxi-c.
In trials in 1946/50 DDT and chlordane gave the best results.

h Dean, H. A., and Olson, E. O.
Preliminary studies to determine possibility of insect transmission of tristeza virus in Texas.
J. Rio Grande Valley hort. Soc., 1956, **10**: 25-30, bibl. 16.
Aphis spiraecola and *A. gossypii* did not transmit.

i Dickson, R. C., and others.
Flying aphid populations in southern California citrus groves and their relation to the transmission of the tristeza virus.
Phytopathology, 1956, **46**: 204-10, bibl. 7.
Numbers of *Aphis gossypii* and tristeza spread related.

j Dowson, V. H. W. (Translator).
An account of the date palm by Francesco Redi, A.D. 1666.
Trop. Agriculture Trin., 1956, **33**: 207-13, bibl. 2.
Including methods of pollination and variety descriptions.

k Elant, [H.].
La coulure des oliviers. **(Failure of olives to set fruit.)**
Terre maroc., 1956, **30**: 179-80.
Methods of improving fruit set discussed.

l Gillespie, H. L.
Gae avocado, a Fuerte mutation.
Calif. Citrogr., 1956, **41**: 346-7, illus.

m Goodall, G. E.
Lemon varieties for profit.
Citrus Leaves, 1956, **36**(6): 10, 28.
Notes on 8 varieties and nucellar strains.

n Graniti, A.
Ricerche sulle anomalie fogliari dell'olivo in Sardegna. II. Alterazioni riferibili all'azione di *Pollinia pollini* Costa. **(Research on olive leaf malformations in Sardinia. II. Lesions attributed to *Pollinia pollini*.)** [English summary 6 lines.]
Ann. Sper. agrar., 1956, **10**: 983-91, bibl. 16, illus.

o Hamilton, R. A., and Storey, W. B.
Macadamia nut production in the Hawaiian Islands.
Econ. Bot., 1956, **10**: 92-100, bibl. 12, illus.
A review covering botany, history, culture, varieties, harvesting and processing.

p Ishii, M.
Nursery sanitation for nematode control.
Hawaii Fm Sci., 1956, **4**(4): 2, 5, 8.
With special reference to *Radopholus similis*.

q Johri, B. M., and Ahuja, M. R.
Development of endosperm and nucellar polyembryony in *Aegle marmelos* Correa.
Curr. Sci., 1956, **25**: 162-4, bibl. 6, illus.
Histological data.

r Kime, C. D., Jr.
New methods and techniques in planting young citrus trees.
Citrus Mag., 1956, **18**(11): 17-18.
With available machines 12 men can plant 30–35 acres per day.

s Kozlova, V. I.
The diagnosis of infectious scaly bark [psorosis] in citrus. [Russian.]
Agrobiologija, 1956, No. 1, pp. 129-32, bibl. 10, illus.
Early diagnosis by leaf markings [see also *H.A.*, 24: 4222].

t Lewis, H. C.
Mexican fruit fly and citrus blackfly.
Calif. Citrogr., 1956, **41**: 287, 296-300, illus.
Programme to prevent establishment in the U.S.

u Lime, B. J., Stephens, T. S., and Griffiths, F. P.
Processing characteristics of colored Texas grapefruit. II. Correlation of color measurements and pigment analyses of Ruby Red grapefruit.
J. Rio Grande Valley hort. Soc., 1956, **10**: 53-63, bibl. 4.

v Marinucci, M.
Il gelo e gli olivi. **(Frost and the olive.)**
Inf. fitopat., 1956, **6**: 106-8, illus.
Notes on treatment of frost injuries.

w Marloth, R. H.
Citrus and subtropical fruit research in South Africa.
Trop. Agriculture, Trin., 1956, **33**: 201-6, illus.
Work, especially at Nelspruit, reviewed.

x MILLER, M. P.
Bare root trees have advantages.
Calif. Citrogr., 1956, **41**: 354, illus.
Advantages summarized with reference to citrus.

y NADEL-SCHIFFMANN, M., AND LITTAUER, F.
Mode of infection of *Penicillium digitatum* and *P. italicum* in citrus fruits.
Ktavim, 1956, **6**: 61-7, bibl. 7.
Experiments comparing various types of wound.

z NAUER, E., AND MOORE, P.
Mapping for orchard appraisal.
Calif. Agric., 1956, **10**(7): 5-6, 14.
See *H.A.*, 25: 3175.

4128.

a NEWHALL, W. F., AND GRIERSON, W.
A low-cost, self-polishing, fungicidal water wax for citrus fruit.
Proc. Amer. Soc. hort. Sci., 1955, **66**: 146-54, bibl. 12, illus.
See *H.A.*, 26: 3100.

b NOUR-ELDIN, F.
Phloem discoloration of sweet orange.
Phytopathology, 1956, **46**: 238-9, bibl. 5, illus.
Observed in stunted trees on sour orange stocks in Egypt.

c OLSON, E. O., COHEN, M., AND RODRIGUEZ, T.
Tangerine declines in the state of Nuevo Leon, Mexico.
J. Rio Grande Valley hort. Soc., 1956, **10**: 34-7, bibl. 5.
Due to cachexia, psorosis and an unidentified disorder, but not tristeza.

d PACI, P.
Osservazioni sul valore della morfologia dello stimma nella classificazione delle cultivar d'olivo. **(Observations on the value of the morphology of the stigma in the classification of olive varieties.)** [English summary 6 lines.]
Ann. Sper. agrar., 1956, Vol. **10**, No. 3, Suppl. pp. xxxv-xlv, bibl. 22, illus.
Stigma characters of 24 varieties too variable to be of use.

e PREST, R. L., AND ROSS, A. A.
The avocado.
Qd agric. J., 1956, **82**: 19-26, illus.
Climate, soil, varieties, propagation, soil management and harvesting.

f RICHARD, E.
Les fruits en Afrique du Sud. **(Fruit in South Africa.)**
Fruits d'Outre Mer, 1956, **11**: 191-211, illus.
With particular reference to citrus.

g DE LA ROCHA G., G.
El "afrancamiento" en plantas cítricas. **(Inducing scion rooting in citrus.)**
Agronomía, Peru, 1954, **19**(77): 74-6, from abstr. in *Supl. bibl. Turrialba*, 1955, **5**: 25.
By earthing up tristeza-infected trees [see also *H.A.*, 24: 1831].

h ROUSE, A. H., AND ATKINS, C. D.
Pectinesterase and pectin in commercial citrus juices as determined by methods used at the Citrus Experiment Station.
Tech. Bull. Fla agric. Exp. Stats **570**, 1955, pp. 19, bibl. 24.

i SAMISH, Z.
Citrus products in Israel: a review.
Ktavim, 1956, **6**: 149-62, bibl. 39.
Status of industry, processing methods and research on products.

j SIEGELMAN, H. W., AND CRAFT, C. C.
The polyphenolic compounds of the persimmon fruit.
From abstr. in *Plant Physiol.*, 1956, **31** (Suppl.): xxxviii.
Astringency related to leucoanthocyanins.

k SMIRNOFF, W.
Recherches de moyens de lutte biologique contre *Parlatoria blanchardi* Targ. dans les oasis marocaines. **(Studies on the biological control of *Parlatoria blanchardi* in Moroccan oases.)**
Terre maroc., 1956, **30**: 153-4.
On dates; results with introduced predators encouraging.

l SMITH, R. J.
Economics of the lemon industry.
Econ. Bot., 1956, **10**: 66-74, bibl. 11.
In southern California.

m VOLCANI, R.
A survey of the use of citrus fruit and waste for feeding cattle in Israel.
Ktavim, 1956, **6**: 135-47, bibl. 24.
Including data on peel composition.

n WAHLBERG, H. E.
Citrus growing in Thailand.
Calif. Citrogr., 1956, **41**: 286, 300-2, illus.
Thailand starts citrus improvement program.
Citrus Leaves, 1956, **36**(7): 10-11, 22, 26, illus.

o WANDER, I. W., AND MCBRIDE, J. J., Jr.
Chlorosis produced by fluorine on citrus in Florida.
Science, 1956, **123**: 933-4, bibl. 6, illus.
Resembling that of B deficiency [for details, see *H.A.*, 26: 3078].

TROPICAL FRUIT AND PLANTATION CROPS.

General.

(*See also* 3644-3649, 4254w, 4272, 4278, 4280, 4283, 4284, 4287, 4289, 4291, 4294b, h, i.)

4129. Anon.
Notes on current investigations (agronomy) July to September, 1955.
Malay. agric. J., 1955, **38**: 268-72.

Pineapples: results of a "rate of potash" trial emphasize the importance of K for the Singapore Spanish variety, the optimum rate being 150 lb. per acre; both carbide and NAA induced flowering of Singapore Spanish, but the fruits were larger and more advanced with carbide. *Tea:* cuttings in special beds under *Erythrina* shade have shown 70–100% rooting. *Vegetables:* in a lowland cauliflower trial only Early Patna and Early Market produced heads. *Fruit:* rambutan budwood aged 9 months or more gave better results than younger wood; natural petiole abscission induced by removing leaves 14 days before cutting the budwood is essential.

4130. Anon.
Notes on current investigations (research) July to September, 1955.
Malay. agric. J., 1955, **38**: 262-7.

Cacao: different types of leaf rim blight have been induced in sand culture by Ca, K and Mg deficiencies; severe defoliation by *Orthocraspeda trima* was controlled by fogging with DDT and spraying with lead arsenate. *Coconut:* Aldrex, Dieldrex and BHC all caused at least 90% mortality of *Oryctes rhinoceros* larvae in boxes of sawdust 20 days after spraying. *Pineapple:* fumigation of planting material with HCN or methyl bromide did not prevent the spread of mealy bugs (*Dysmicoccus brevipes*).

4131. Wolcott, G. N.
Experiences with entomogenous fungi in Puerto Rico. [Spanish summary 1 p.]
Bull. agric. Exp. Stat. P.R. **130**, 1955, pp. 19, bibl. 13, illus.

The dependence of entomogenous fungi on very high humidity was shown conclusively by observations and experiments. Examples given of complete control under such conditions include: cottony cushion scale on citrus and larvae of *Anticarsia gemmatilis* on velvet bean and cowpea by *Spicaria* spp.; yellow aphid (*Sipha flava*) on sugar cane by *Acrostalagmus aphidum*; *Myzus persicae* on wild mustard by *Empusa aphidis*; seagrape sawfly (*Sericocera krugii*) by *Beauveria bassiana.* Alleged control of frog hoppers and white grubs in sugar cane by *Metarrhizium anisopliae* was not confirmed in Puerto Rico.

4132. Ghafoor, A., and Hafiz, A.
Sooty mold disease of certain economic host plants in Karachi area.
From abstr. in *Proc. 6th Pakistan Sci. Conf., Karachi, 1954, Part III*, pp. 66-7.

Sooty mould has been found to occur on a large number of host plants including mango, gourd, custard apple, citrus, guava, water melon, eggplant, rose, chrysanthemum, rice and some grasses. The symptoms of the disease and the fungi associated with it are listed. Experiments have shown that the disease can be easily controlled by spraying with any sulphur fungicide such as Spersul, lime-sulphur or wettable sulphur. Three to four weekly or fortnightly applications of Spersul at 1½–2 lb. per 100 gal. have been found to check it successfully. A combined application of Spersul (1½ lb./100 gal.) and Perenox (3½ lb./100 gal.) was especially effective both for protection and eradication.—Mycology and Plant Path. Div., Dep. Plant Protection, Karachi.

Bananas.

(*See also* 3391, 4254c, 4255f, r, 4256f.)

4133. de Coene, R.
Le bananier dans la rotation en zone cotonnière nord. (**Bananas in the rotation in the northern cotton zone.**)
Bull. Inf. INEAC, 1956, **5**: 113-26.

Experiments in the Belgian Congo at Boketa (Ubangi), Uele and Bafwasende led to recommendation of the following rotation: 1st year, bananas intercropped with rice and cassava; 2nd and 3rd years, bananas with cassava, the harvesting of bananas being spread over both years; 4th year, maize and other local vegetables, followed by cotton; 5th year, groundnuts, followed by cotton; 6th to 20th years, bush fallow. The three districts are very dissimilar, but this type of rotation proved highly satisfactory in all three and gave better results than either excluding bananas or replacing their culture by a one- or two-year fallow after clearing forest or savanna.

4134. Guyot, H., and Cuillé, J.
Les traitements fongicides des bananeraies. III. Résultats pratiques obtenus en Guadeloupe lors des applications par brouillards légers huileux. (**Fungicidal treatments of banana plantations. III. Practical results obtained in Guadeloupe from applications in oil as light mists.**)
Fruits d'Outre Mer, 1956, **11**: 141-50, bibl. 4, illus.

The average cost of mist applications in oil was considerably lower than that of aqueous sprays involving the use of wetting agents. Misting had no adverse effects and average bunch weight was 20 kg. or more in a small treated pilot plantation, compared with 10–12 kg. in controls of other experiments. Technical features of misting and fogging are discussed. In 1954, with zineb as the fungicide, misting gave a higher mean bunch weight than fogging. In the following year the difference was negligible, but *Cercospora* control was distinctly better under misting. Oil applied without any fungicide gave 3·8% lower production from misting and 4·4% lower from fogging. The addition of 500 g. of copper oxychloride per 20 l. of oil per ha. was economic. The use of gas-oil alone or in combination with oil was unsatisfactory. Monthly intervals between treatments were much inferior to those of 2 or 3 weeks. Factors tending to reduce the efficiency of treatments are discussed. [For Parts I and II, see *H.A.*, 25: 995, 3254.]

4135. Guyot, H., and Cuillé, J.
L'utilisation des atomiseurs à débit réduit pour les traitements du sol. La lutte contre le charançon du bananier (*Cosmopolites sordidus*, Germ.) aux Antilles françaises. **(The use of low-volume sprayers for soil treatments. Control of the banana borer in the French West Indies.)**
Fruits d'Outre Mer, 1956, **11**: 249-53, bibl. 17, illus.

In preliminary trials low volume sprays of 20% and 40% aldrin at 12·5 and 6·25 kg. in about 120 l. per ha. significantly reduced the population of banana borers.

4136. van Dinther, J. B. M.
De bananensnuitkever, *Cosmopolites sordidus* Germ. **(The banana root borer.)** [English summary ½ p.]
Surinaam. Landb., 1956, **4**: 67-71, bibl. 5, illus.

The life history and injury caused by *Cosmopolites sordidus* are described. In experiments watering the plant holes with a 0·1% chlordane suspension before planting banana suckers gave effective control.

4137. Deullin, M.
Les travaux du groupe d'étude de l'institut international du froid sur le transport de la banane. **(The work of the study group of the International Institute of Refrigeration on the transport of bananas.)**
Fruits d'Outre Mer, 1956, **11**: 171-2.

A brief account is given of questions raised on (1) fruit quality at loading, (2) atmosphere in the ship's hold, (3) cooling of the fruit and (4) management of holds. Conclusions reached were: that high relative humidity was essential; that the level of relative humidity must be considered in relation to air circulation; and that two stages should be distinguished for cooling curves, (*a*) that concerned with rapid cooling to 14°–15° C., and (*b*) that involving gradual adjustment to the final storage temperature.

4138. Freiberg, S. R.
Effect of growth-regulators on ripening, split peel, reducing sugars, and diastatic activity of bananas.
Bot. Gaz., 1955, **117**: 113-19, bibl. 11.

The immersion of banana stems in solutions containing 1,000 p.p.m. sodium 2,4-D, 2,4,5-T or CPA (parachlorophenoxyacetic acid) accelerated ripening. The effect was more marked on pulp ripening than on skin ripening. These results were obtained in an improvised ripening room which was well-ventilated but without temperature or humidity control. Accelerated ripening was also induced when either the cut end of the fruit stem was dipped in a solution of 1,000 p.p.m. of 2,4-D, or when detached hands were entirely or partly immersed in the solution for a few seconds. Attached single fingers of bananas injected with the 2,4-D solution turned yellow while adjacent figures remained green. Treatment with 2,4-D reduced the occurrence of longitudinal peel splitting under controlled and uncontrolled temperature conditions. There was an indication that water was retained in the tissues as a result of treatment. The content of reducing sugars and the diastatic activity of 2,4-D-treated bananas were considerably higher than in the corresponding controls by the fourth day after treatment.—United Fruit Co., La Lima, Honduras.

Cacao.

(*See also* 4254o, 4255u, 4256b, 4279.)

4139. Burgos L., J. A.
Posibilidades industriales del cacao Pound en el Peru. **(Industrial possibilities of the Pound cacao clones in Peru.)**
Bol. trim. Exp. agropec. P.C.E.A., Lima, 1955, **4**(2): 8-11.

Data are given on the productivity, quality and composition of some Pound cacao clones, resistant to *Marasmius perniciosus*, tested at the Agricultural Experiment Station, Tingo Maria. Selection No. 2230–7 appeared to be the most productive and the least variable of those tested.

4140. Jolly, A. L.
Clonal cuttings and seedlings of cocoa.
Trop. Agriculture Trin., 1956, **33**: 233-7, bibl. 1.

Trees raised from cuttings of 3 clones yielded 1,040 lb. per acre per year compared with 540 lb. per acre per year from trees raised from seedlings of the same clones.—I.C.T A , Trinidad.

4141. McKelvie, A. D.
Cherelle wilt of cacao. I. Pod development and its relation to wilt.
J. exp. Bot., 1956, **7**: 252-63, bibl. 29.

The development of cacao pods of 3 different selections was studied in relation to pod loss through cherelle wilt. [For a preliminary account see *H.A.*, 26: 2182.] Pods were observed to be specially liable to wilt at two stages in their development, which were called "first wilt" and "second wilt". First wilt reaches its peak at 7 weeks after pollination and is shown to cease as cell walls are laid down in the endosperm. Second wilt reaches its peak at 10 weeks from pollination and declines in response to greatly increased pod metabolism. Pods which wilt during second wilt have larger embryos and smaller pod stalks than comparable healthy pods. It is postulated that both types of wilt arise as a result of a lack of hormones produced by the endosperm, causing a decrease in the uptake of water and food materials. [From author's summary.]—W.A.C.R.I., Tafo.

4142. Cornwell, P. B.
Some aspects of mealybug behaviour in relation to the efficiency of measures for the control of virus diseases of cacao in the Gold Coast.
Bull. ent. Res., 1956, **47**: 137-66, bibl. 14, illus.

When cacao trees infected with swollen shoot are cut down and stacked in "slash piles" mealybugs (*Pseudococcus njalensis*) are not capable of migrating to healthy trees at distances greater than 4 ft. from the piles in the period during which the virus may persist within them. Even in the presence of their attendant ants the establishment of mealybugs on their new hosts is very poor. The process of "cutting out" is therefore considered to be an efficient method of controlling the spread of the virus.—W.A.C.R.I.

4143. Thorold, C. A.
Observations on cacao pod production in relation to the incidence of black-pod disease, caused by *Phytophthora palmivora.*
J. hort. Sci., 1956, **31**: 149-55, bibl. 11.

There is a tendency for black-pod percentages to be positively associated with the total numbers of pods in certain circumstances. When black pods are removed frequently, their occurrence early in the season may be associated with greater total numbers of pods. These associations between black-pod percentages and total numbers of pods are considered in relation to control measures which aim at reducing black-pod percentages. [Author's summary.]—Dep. agric. Res., Nigeria.

4144. McLaughlin, J. H.
El *Phytophthora palmivora* Butl. y un insecto membrácido como causantes del cherelle wilt en Costa Rica. **(*Phytophthora palmivora* and a membracid insect as causes of cherelle wilt in Costa Rica.)**
Comun. Turrialba **18**, 1952, reprinted in *Suelo Tico*, 1956, **9**: 167-75, bibl. 8.

An account is given of experiments carried out by various workers in Costa Rica during 1949–51 on the causes of cherelle wilt of cacao [see also *H.A.*, 22: 3042 and 24: 4299]. *Phytophthora palmivora* attacks the peduncles or pods at any stage of development and can invade either injured or uninjured tissues; when the peduncle is invaded the fruit turns yellow, but when the pod itself is invaded it develops a coffee colour. A membracid insect [unspecified] can also cause wilt, attacking the peduncles, turning the pod yellow and causing most damage to pods less than 2 cm. long; its attack probably facilitates the entry of the fungus. A physiological wilt, probably caused by drought, also occurs.

4145. Owen, H.
Further observations on the pathogenicity of *Calonectria rigidiuscula* (Berk. & Br.) Sacc. to *Theobroma cacao* L.
Ann. appl. Biol., 1956, **44**: 307-21, bibl. 11.

The results confirm that *C. rigidiuscula* is the most important fungus infecting mirid lesions and causing dieback of cacao in West Africa. Inoculation tests with a range of Amelonado and Trinitario clones suggested that the clones vary in their susceptibility to *C. rigidiuscula*, but the plant-to-plant variation was too great to conclude that any one is highly resistant. Various types of introduced cacao were also tested; preliminary experiments indicate that certain types of Upper Amazon cacao may be resistant, but they need further investigation. [From author's abstract.]—W.A.C.R.I., Tafo.

4146. Desrosiers, R., Bolaños, C. W., and Vargas, J.
Evaluación de clones de cacao en relación con su resistencia a la escoba de bruja (*Marasmius perniciosus*, Stahel). **(Evaluation of cacao clones in relation to their resistance to witches' broom [*Marasmius perniciosus*.].)** [English summary 10 lines.]
Turrialba, 1955, **5**: 78-82, bibl. 3.

The index of susceptibility for each clone was termed the "broom-age ratio" and was found by dividing the average number of brooms per tree by the age in years, which was the same for all the trees of any one group. Values ranged from 0·17 to 16·0, those $>1{\cdot}5$ representing susceptibility, those from 1·0 to 1·5 moderate resistance and those $<1{\cdot}0$ probably strong resistance. Clones of this last category needed repeated observation and checking before their resistance could be established.

4147. Whistler, R. L., Masak, E., Jr., and Plunkett, R. A.
Cacao polysaccharides.
J. Amer. chem. Soc., 1956, **78**: 2851-3, bibl. 15.

Two distinct hot-water-soluble polysaccharides are extractable from mature Caracas cacao fruit husk and seed. Preliminary work indicates the husk polysaccharide to be composed mainly of L-rhamnose, L-arabinose, D-galactose and D-mannose plus small amounts of glucose, xylose and an unidentified pentose. The seed polysaccharide contains the same major components but in different proportions. [Authors' abstract.]—Purdue Univ. agric. Exp. Stat., Lafayette, Ind.

4148. Dittmar, H. F. K.
The composition of the pulp of various varieties of Bahia cocoa.
Gordian, 1956, **56**: 16-18 [German], 18-19 [English], bibl. 7.

In the fresh pulp of pods of 5 types of cacao in Bahia, monosaccharides accounted for 75% or more of the dry matter. Disaccharides ranged from 0·7 to 7·0% of the total sugars. Pectin varied from 0·9 to 1·19% D.M. and total N from 0·09 to 0·11% D.M. The composition of the pulp of the Bahia cacaos corresponded with that reported earlier for St. Lucia cacao with exception of the content of acids which was much higher in the former.

4149. Carena, A.
L'uso alimentare dei gusci di cacao. **(Use of cacao pods as stock feed.)**
Reprinted from *Riv. Zootec.*, 1954, No. 10, pp. 12, bibl. 18, illus.

Mixed with other foodstuffs cacao pods are suitable for cattle and sheep and, in smaller proportions, for pigs. They are slightly lower in nutritional value but much cheaper than bran.

Coconuts.

(*See also* 3586, 4254n, 4255c, d, i, 4256d.)

4150. Calderón, J. R.
Estudio sobre los costos para producir el coco en Puerto Rico, 1951. **(Study on cost of production of coconuts in Puerto Rico, 1951.)** [English summary 1 p.]
Bol. Estac. exp. agric. Rio Piedras **127**, 1955, pp. 20.

Coconut production figures for Puerto Rico are given for a number of years between 1910 and 1945. Economic data for 1951 are based on 38 plantations in an area of level topography with sandy soils and an annual rainfall of 60–65 in. Highest returns were obtained by farmers who produced over 2,000 nuts per cuerda [approx. 1 acre], over 1,400 nuts per man-day, had 50 or more palms per cuerda and incurred growing expenses of from $2.00 to $6.99 per cuerda.

4151. Liyanage, D. V.
Intra-specific hybrids in coconuts. I. Preliminary report on crosses between *typica* and *nana* varieties.
Bull. Coconut Res. Inst. Ceylon **7**, 1956, pp. 16, bibl. 12, illus.

This is the first of a series of interim statements on long-range research on breeding in progress at the Institute. The performance of hybrids between *typica* [the usual tall Ceylon type] and *nana* [dwarf] varieties of coconut palms during the first five years of growth is described. The first generation palms have shown hybrid vigour with respect to leaf-production and formation of stem. They are early flowering and do not exhibit periodicity in flower production as does the *nana* parent. The cross-fertilization mechanism of the *typica* parent is completely dominant. Generally the *typica* characters predominate in the hybrid. Nuts are large and heavy and copra is of good quality. [Author's summary.]

4152. Davis, T. A.
Branching in coconut palms.
Bull. Indian centr. Coconut Cttee, 1956, **9**: 197-200, illus.

Possible causes of branching are discussed, and examples are given of palms on which 2 to 26 crowns developed. Contrary to the belief that branched palms do not fruit, all the trees in question are productive.

4153. de Vos, L.
Een snelle droogmethode voor kopra. **(A quick drying-method for copra.)** [English summary 10 lines.]
Surinaam. Landb., 1956, **4**: 119-22, bibl. 3.

The fresh meat is sliced and dried in a tunnel-dryer at an air temperature of 90° C. and an air velocity of about 80 m./min. Drying takes 1 hour. High quality copra is obtained with a moisture content of less than 5%. Oil expelled from this copra is of good quality and did not turn rancid during 8 months' storage in bottles.

4154. Anon.
Cocosoliebereiding. **(The processing of coconut oil.)**
Surinaam. Nieuws, 1956, **7**(17): 1-2, from *Trop. Abstr.*, 1956, Vol. **11**, abstr. d1532.

The Agrarian Technological Service in Surinam has evolved methods, which enable copra of a very high quality, containing a maximum of 5% moisture, to be prepared within an hour, and also a very efficient pressing method for the oil using screw presses of a special type.

Coffee.

(*See also* 4254a, e, i, p, 4255e, n, 4257, 4279.)

4155. Anon.
Variedades de café na Mogiana. **(Coffee varieties in the Mogiana district.)**
Estado de S. Paulo, reprinted in *Bol. Super. Serv. Café, S. Paulo*, 1955, **30** (338): 27-8.

Varieties recommended for the saline soils of this district between São Paulo and Minas Gerais are Bourbon Amarelo, Bourbon Vermelho, Caturra Amarelo, Caturra Vermelho and Mundo Novo.

4156. Alves, A.
Melhoramento do cafeeiro. VIII. Novas determinações sôbre poliembrionia, sementes sem embrião e lojas dos frutos sem sementes em *Coffea*. **(Coffee breeding. VIII. Further data on polyembryony, seeds without embryos and fruit loculi without seeds in *Coffea*.)** [English summary ½ p.]
Bragantia, 1955, **14**: 285-300, bibl. 9.

Data were collected on the frequency of the three seed abnormalities in *Coffea canephora*, *C. dewevrei*, *C. congensis*, *C. liberica* and 15 varieties of *C. arabica*, also in the hybrids *C. arabica* × *C. dewevrei* and *C. liberica* × *C. dewevrei*. Triembryonic seeds were rare. False polyembryony, resulting in "elephant bean" seeds with 2 or more seeds per loculus, occurred in approximately 5% of the seeds of *C. congensis*, *C. dewevrei* and three *arabica* varieties. Seedless loculi occurred with 29·5–30% frequency in *erecta* and Mundo Novo (*bourbon*) varieties of *C. arabica*, while frequencies ranging from 11·1–26·7% were recorded for *C. canephora* var. *robusta*, *C. liberica* × *C. dewevrei* hybrid and *C. dewevrei*. Data are also given on the frequencies of peaberry seeds and seeds from trilocular fruits.

4157. Antunes (Filho), H., and Carvalho, A.
Melhoramento do cafeeiro. VII. Ocorrência de lojas vazias em frutos de café "Mundo novo". **(Coffee breeding. VII. Occurrence of empty loculi in fruits of Mundo Novo coffee.)** [English summary ⅔ p.]
Bragantia, 1954, **13**: 165-79, bibl. 18.

Empty loculi occurred frequently in 42% of the 1,096 plants studied in four localities. The ratio of plants with high and low frequencies of empty loculi tended to be constant for the same progenies at different localities, suggesting the genetical nature of the feature. Flotation of fruits in water was a sufficiently accurate method of detecting empty loculi for field work.

4158. Mendes, A. J. T., Medina, D. M., and Conagin, C. H. T. M.
Citologia do desenvolvimento dos frutos sem sementes no café "Mundo Novo". **(Cytology of the development of seedless fruits in Mundo Novo coffee.)** [English summary ½ p.]
Bragantia, 1954, **13**: 257-79, bibl. 7, illus.

Chromosome irregularities in microsporogenesis occurred as frequently in Mundo Novo plants producing low as in those producing high percentages of seedless fruits. In the latter group, however, irregularities in the formation and post-pollination development of the embryo sac were much more numerous and varied than in the former. The excess of seedless fruits was accounted for by the production of arrested "discoid" endosperm and abortive ovules. Abnormal pollen also considerably increased the percentage of seedless fruits.

4159. Carvalho, A., and Antunes (Filho), H.
Melhoramento do cafeeiro. X. Seleção visando eliminar o defeito "lojas vazias do fruto" no café Mundo Novo. (**Coffee breeding. X. Selection aiming at the elimination of the "empty fruit loculi" defect in Mundo Novo coffee.**) [English summary ½ p.]
Bragantia, 1955, **14**: 51-62, bibl. 3.

A high proportion of the seedlings of Mundo Novo coffee, a strain of *C. arabica* var. *bourbon*, produce an abnormally large number of fruits with empty locules. Investigation showed that this character was heritable and did not occur among the progenies of normal plants. Among seedlings from unselected plants about 50% were defective compared with only 2% to 7% among seedlings from selected normal plants.

4160. Mendes, A. J. T., and Medina, D. M.
Contrôle genético dos "frutos chochos" no café "Mundo Novo". (**Genetical control of "empty fruits" in Mundo Novo coffee.**) [English summary ¾ p.]
Bragantia, 1955, **14**: 87-99, bibl. 4.

Selection and surveys of several generations of progeny from Mundo Novo coffee plants producing many empty fruits and "discoid" endosperm confirmed the assumption that the defect was due to a single recessive genetic factor, present in the heterozygous condition and apparently lethal when homozygous. Normal plants, producing fully developed endosperm and a low percentage of empty fruits were homozygous for the dominant allele.

4161. Mendes, A. J. T., and Conagin, A.
Produtividade e rendimento das duas classes de plantas existentes no café "Mundo Novo". (**Productivity and yield of the two types of plant found in Mundo Novo coffee.**) [English summary ½ p.]
Bragantia, 1955, **14**: 101-7, bibl. 4.

Plants with a high proportion of empty fruits and arrested "discoid" endosperm (genetically *Dd*) gave higher fruit yields, but not higher seed yields, than normal plants (*DD*). Seed for planting should be selected from normal plants as *Dd* plants are relatively uneconomic.

4162. Krug, C. A., Carvalho, A., and Antunes (Filho), H.
Genética de *Coffea*. XXI. Hereditariedade dos característicos de *Coffea arabica* L. var. *laurina* (Smeathman) D.C. (**Genetics of *Coffea*. XXI. Inheritability of characteristics of *Coffea arabica* L. var. *laurina*.**) [English summary ½ p.]
Bragantia, 1954, **13**: 247-55, bibl. 10.

The characteristics distinguishing the *laurina* from the *typica* variety of *Coffea arabica* are briefly described. One plant derived from *laurina* × *C. canephora* resembled *canephora* when young, but mature leaves were intermediate in size between the parent types. Compared with *bourbon*, *laurina* yields were lower, but the quality of the coffee was higher. A deep root system resulted from the crossing of *laurina* with *maragogipe*.

4163. Carvalho, A., and Antunes (Filho), H.
Genética de *Coffea*. XVIII. Variegação no cafeeiro. (**Genetics of *Coffea*. XVIII. Variegation in the coffee plant.**) [English summary ⅓ p.]
Bragantia, 1954, **13**: 85-93, bibl. 15, illus.

Variegated types of *Coffea arabica* are probably not distinct varieties. In one type an irregular variegation pattern is associated with leaves of normal shape and texture and only few branches are affected. In another type the leaves are deformed and the pattern is uniform throughout the plant. Preliminary genetical data show transmission of variegation by cytoplasm and not by pollen in one plant of the first type. Transmission by pollen is probable in a plant of the second type.

4164. Bacchi, O.
Seca da semente de café ao sol. (**Sun-drying of coffee seed.**) [English summary 12 lines.]
Bragantia, 1955, **14**: 225-36, bibl. 14.

Hulled coffee seed suffered no loss of viability from exposure to sunlight provided the moisture content was not reduced below 8–9%. The danger of sun-drying is that the moisture content may fall rapidly to 7% or less. In São Paulo state shade-drying is always safe, because the moisture content never falls below the critical level.

4165. Carvalho, A., Antunes (Filho), H., and Nogueira, R. K.
Genética de *Coffea*. XX. Resultados preliminares do tratamento de sementes de café com raios-X. (**Genetics of *Coffea*. XX. Preliminary results of treating coffee seeds with X-rays.**) [English summary ⅓ p.]
Bragantia, 1954, **13**: xvii-xx, bibl. 8, illus.

Seeds of *bourbon*, *purpurascens* and hybrids of these varieties were dried and after removal of the parchment exposed to X-rays ranging from 4,200 to 150,000 *r*. Only 31 seedlings were obtained from 480 germinations out of the 1,350 seeds treated. Those from high-dosage treatment reached only 5 mm. in height, became hypertrophied and slowly died. Above 14,000 *r* no seedlings developed. Initial growth was slower in all cases than in untreated controls. Some leaf abnormalities occurred.

4166. Pagacz, E.
Nouveaux progrès dans la technique du bouturage du caféier Robusta. (**New advances in the technique of propagating robusta coffee from cuttings.**)
Bull. Inf. INEAC, 1956, **5**: 127-39, bibl. 1, illus.

Cuttings, taken from young green suckers, consisted of 8 cm. of internode surmounted by a pair of leaves. The tip was trimmed off immediately above the leaf junctions, suppressing secondary axillary buds and dispensing with healing agents. The distal half or two-thirds of each leaf was cut off and the cutting was pushed far enough into the substrate to keep the attached leaf portions nearly vertical. Multiplication was markedly increased, especially in ventilated frames, by splitting cuttings vertically. The traditional river-sand substrate was advantageously replaced by sawdust, other suggested alternatives being either coffee parchment plus sawdust, rice husks, or fibres from palm leaf stalks. The construction of frames, with and without protective lattices, is described in detail. The optimal density for split cuttings was about 400 per sq. m. Rooted cuttings were planted out singly in pots, each made from a leaf of "mangungu" (*Megaphynium macrostachyum*). These were cheaper than, and as durable as, the basket pots in common use.—Centre exp. Caféicult. Uele, Nebanguma.

4167. Piringer, A. A., and Borthwick, H. A.
Photoperiodic responses of coffee. [Spanish summary 11 lines.]
Turrialba, 1955, **5**: 72-7, bibl. 5, illus.

In pot experiments at Beltsville, Maryland, with coffee plants aged 18 months flowering was earlier and more profuse under 8-hour than under longer photoperiods. The critical duration was 13–14 hours and beyond 14 hours flower buds did not form. Long-day treatment increased the number of nodes and length of internodes on lateral shoots. Exposure to relatively dim light for 3 hours in the middle of the natural night acted in a manner similar to long-day treatment. Alternate drying and wetting of the soil accelerated the opening and anthesis of flower buds.

4168. Robinson, J. B. D., and Melville, A. R.
The effect of rainfall and other factors on coffee production yields in Kenya 1947-1955.
Mon. Bull. Coffee Bd Kenya, 1956, **21**: 96-8.

Yields per acre of coffee in Kenya have steadily improved since 1947/48, but an examination of district records shows that this has not been a simple reaction to the slight overall increase in rainfall. The substantial increase in production must be attributed mainly to improved field and factory practices.

4169. Lazzarini, V.
Tratamento dos cafés geados. (**The treatment of frost-damaged coffee.**)
Bol. Super. Serv. Café, S. Paulo, 1955, **30**(338): 54-6.

Frost-damaged coffee trees should not be pruned but should be gradually disbudded to leave 1 or 2 shoots per stem. Badly damaged trees on new soil may be left unmanured, but less severely injured trees require a well-balanced fertilizer. If it is financially necessary to intercrop, a leguminous crop should be grown.

4170. Bock, K. R., and Rayner, R. W.
Control of coffee berry disease in Kenya.
Nature, 1956, **178**: 217-18, bibl. 3.

Fifteen fungicidal treatments were applied to coffee to control *Colletotrichum coffeanum* during the 2 rainy seasons. Perenox applied at fortnightly intervals and Verdasan at monthly intervals gave effective control. In laboratory tests griseofulvin at 880 p.p.m. gave results similar to those obtained with Verdasan. Repeated applications of calcium sulphamate at 1, 3 and 6% were highly phytotoxic.—Coffee Res. Stat., Ruiru.

4171. Castaño A., J. J.
Muerte descendente (die-back) en cafetos de toda edad en varias regiones del Departamento del Cauca. (**Die-back of coffee trees of all ages in various regions of the Department of Cauca, Colombia.**)
Bol. inf. Café, Chinchina-Caldas, 1956, **7**(73): 12-20, bibl. 7, illus.

A die-back of the branches and young shoots of coffee, accompanied by defoliation, was found to be caused by *Colletotrichum coffeanum*. Different strains of the fungus were found to occur. The fungus developed most rapidly at temperatures between 24° and 28° C. and at high humidity. Copper sprays (copper oxide at 800 g. per 100 l. or fermate at 1 lb. per 100 l.) considerably reduced the amount of infection.

4172. Mariconi, F. de A. M.
Bicho mineiro das folhas do caffèeiro. (**Coffee leaf miner.**)
Fôlha da Manhã, reprinted in *Bol. Super. Serv. Café, S. Paulo*, 1955, **30**(338): 32-4.

Organic manuring and irrigation to keep the trees growing vigorously can to a great extent prevent damage by coffee leaf miner. BHC dusts containing 1% gamma isomer applied every 20–25 days from the beginning of the dry season will control the adults. A spray mixture of dieldrin and rhodiatox is recommended for control of the larvae.

4173. Gonzalez M., R., and Valenzuela V., G. O.
Investigaciones sobre el combate de los complejos simbióticos radiculares cóccidos-hormigas del cafeto (*Puto* spp., *Eumyrmococcus* spp., *Rhizoecus* spp., *Geococcus* spp., *Neorhizoecus* spp., *Rhizomyrma* spp.). (**Investigations on the control of the symbiotic root complex of mealybugs and ants on coffee trees.**)
[*Publ.*] *Fed. nac. Cafet. Colomb. Bogotá*, 1955, pp. 40, from abstr. in *Supl. bibl. Turrialpa*, 1955, **5**: 47.

Experiments are described on the following aspects of control: (1) Penetration of dieldrin and chlordane into the soil. (2) Effectiveness of dieldrin, chlordane and DD for control. (3) Penetration and effectiveness of wettable powders. (4) A comparison of emulsions and suspensions. (5) The effect of various chlorinated insecticides in emulsion form. (6) The effect of incorporating decomposed coffee pulp in cultivated soil [see *H.A.*, 25: 4386]. (7) A comparison of 5 concentrations of emulsionable aldrin (Aldrex 2). General conclusions are drawn.

4174. Manjanathaya, G. M.
Field-scale control of white stem borer in coffee—the use of BHC formulations.
Indian Coffee, 1956, **20**: 135-6.

After 8 years of burning infested trees on an estate the incidence of white stem borer [*Anthores leuconotus*] had declined from 229 to 11 plants per acre. A heavy infestation of the borer on another estate was brought under control in 1 year by applying a Gammexane (BHC) paste to all trees. Dieldrin also gave satisfactory control but was more expensive.

4175. Mariconi, F. de A. M.
Os caramujos do cafèeiro. (**Snails as pests of coffee.**)
Fôlha da Manhã, reprinted in *Bol. Super. Serv. Café, S. Paulo*, 1955, **30**(338): 37-8.

In some parts of Brazil snails are a serious pest of coffee, stripping the leaves and bark during the night.

They can be controlled by spraying the trees with an emulsion consisting of 250 c.c. linseed oil, 250 c.c. skimmed milk and 750 g. metaldehyde in 100 l. water. A single spray is generally sufficient for the season, and it should be applied after the first 2 or 3 rains of summer.

4176. Jakobs, H., and Lepp, H. P.
Geen fermentatie bij koffiebereiding. **(No fermentation in coffee preparation.)** [English and Indonesian summaries 8 and 9 lines.]
Bergcultures, 1956, **25**: 223-7, bibl. 4.

In experiments the fermentation of pulped coffee for 36 hours resulted in losses of 1% to 4% in the weight of coffee obtained. Fermentation should therefore be discontinued.

Mangoes.

(*See also* 4032, 4034.)

4177. Nakasone, H. Y., Bowers, F. A. I., and Beaumont, J. H.
Terminal growth and flowering behavior of the Pirie mango (*Mangifera indica* L.) in Hawaii.
Proc. Amer. Soc. hort. Sci., 1955, **66**: 183-91, bibl. 5.

The biennial cycle of the Pirie mango appears to be the result of an extremely long interval between vegetative and flowering flushes. An average of 18 months was found to be necessary between a vegetative flush and subsequent flowering. Deblossomed terminals may re-vegetate from sub-apical buds in 5–7 months. If vegetative flushes are not initiated within that period they will remain inactive and re-flower from sub-apical buds 16–19 months later. Vegetative flushes appear to be scattered throughout the year, but the main flush period is during the summer months. Flushes that occur in summer and autumn are more likely to flower than flushes occurring earlier in the year.—Hawaii agric. Exp. Stat., Honolulu.

4178. Spencer, J. L., Morris, M. P., and Kennard, W. C.
Vitamin C concentration in developing and mature fruits of mango (*Mangifera indica* L.).
Plant Physiol., 1956, **31**: 79-80, bibl. 8.

Vitamin C determinations made for this study on the developing fruits of mango demonstrated a downward trend common to the 4 varieties employed: Amini, Mullgoa, Pico, and Turpentine (native). This decrease in vitamin C concentration, from an average of 88 mg.% to 22 mg.%, was most marked in the period 5 to 10 weeks following fruit set; the final 4 to 6 weeks of fruit maturation was accompanied by little change in ascorbic acid concentrations. Silver nitrate location maps and more refined tests by a diphenyl-hydrazine method showed that the highest concentration of vitamin C in ripe mangoes is not in the portion consumed. The highest concentrations are found in the peel and in the flesh adhering to the husks. The edible portion of mango fruits, however, appears to be a fair source of vitamin C. [Authors' summary.]—Fed. Exp. Stat., Mayagüez, P.R.

4179. Tripathi, R. D.
Malformation disease of the mango as related to deficiency of mineral nutrients.
Indian J. Hort., 1955, **12**: 173-9, bibl. 12.

Symptoms of malformation were described in an earlier article [*H.A.*, 25: 3297]. In micro-nutrient studies with Cu, Zn, B and Mn injections and sprays of these elements did not affect malformation in young or bearing trees. Disturbances of macronutrient nutrition could also be ruled out as causes of the disorder.—Hort. Res. Stat., Saharanpur, U.P.

4180. De, R. K., and Dutta, D. K.
Effect of commercial octamethylpyrophosphoramide (schradan), a systemic insecticide, on the mango hopper *Idiocerus atkinsoni* Lethierry (Homoptera: Jassidae).
Indian J. Hort., 1955, **12**: 165-72, bibl. 12, illus.

A spray of Pestox III at 0·4% was successful in controlling *Idiocerus atkinsoni* on mangoes. Washing the plants 30 minutes after application did not reduce the insecticidal action.—St. agric. Res. Inst., W. Bengal.

Oil palms.

4181. Haines, W. B., and Benzian, B.
Some manuring experiments on oil palm in Africa.
Emp. J. exp. Agric., 1956, **24**: 137-60, bibl. 4.

Results from 10 long-term manurial experiments with oil palms in Nigeria, Cameroons and the Belgian Congo are presented. In general the use of K gave highly economic returns; responses to P were smaller and more variable, while N responses were uncertain or uneconomic. No significant effects resulted from applications of Ca or magnesium limestone or magnesium sulphate. Response varied with soil type and palm variety, and differences could be related to soil analyses for total P and K. The data revealed marked cycles in yield with 3 to 5 year periods, relatively large amplitudes and complicated phase relationships which are probably influenced by the fertilizers.—Rothamsted exp. Stat.

4182. Broeshart, H.
The application of foliar analysis to oil palm cultivation. II. Uptake and distribution of nutrients in mineral-deficient oil palms.
Trop. Agriculture Trin., 1956, **33**: 238-43, bibl. 12.

Total fresh weights of oil palms grown for 2 years in sand culture were determined. The fresh weight of normal palms contained about 1% of N+P+K+Ca+Mg; the distribution of these elements was not significantly altered in P- and Ca-deficient plants. In N-deficient plants nutrients accumulated in the roots, while K deficiency caused an accumulation in the petioles. Nutrients accumulated in leaflets and rachids in Mg-deficient plants. Leaflets of the youngest, fully opened leaf and the petioles were considered to be the most suitable organs for analysis.—Huilever S.A., Belgian Congo. [For Part I, see *H.A.*, 26: 3152.]

4183. Coulter, J. K., and Rosenquist, E. A.
Mineral nutrition of the oil palm. A study of the chemical composition of the frond in relation to chlorosis and yield.
Malay. agric. J., 1955, **38**: 214-36, bibl. 12, illus.

Two types of bronzing in oil palms have been distinguished, viz. orange spotting and yellowing. Yellowing is correlated with the Mg content of the fronds, while orange spotting is connected with K deficiency, and with a high Ca content of the fronds. A high degree of orange spotting is associated with depressed yields.

4184. Crombie, W. M.
Fat metabolism in the West African oil palm (*Elaeis guineensis*). Part I. Fatty acid formation in the maturing kernel.
J. exp. Bot., 1956, **7**: 181-93, bibl. 27.

Using a column chromatographic technique for the estimation and identification of fatty acids, a study has been made of fat formation in developing oil palm kernels from 10 weeks after pollination to full maturity (20 weeks), during which time the fat content may increase a hundredfold. Nuts from 3 different trees have been analysed and differences between these in rates of maturation (as indicated by appearance of the endosperm) can be directly correlated with changes in character of the oil present. Amounts of reducing sugars, sucrose, and starch in the developing endosperm have also been followed, but these carbohydrates are present throughout in low concentration. The mature kernel contains in its fat an unusual mixture of 8 different saturated fatty acids. The major such component is lauric acid (46·1 to 49·5%), and there are present two common unsaturated acids, oleic (15·7 to 16·5%) and linoleic (0·7 to 3·1%). Ten weeks after pollination all these acids are present but in altered proportions, unsaturated acids forming a larger fraction (36·5 to 81·2%, according to tree investigated), and lauric acid a smaller (1·4 to 8·5%). The results suggest that young kernels contain a small quantity of a largely unsaturated "protoplasmic" fat, and that at a stage in development some physiological change in the tissue results in the formation, in large quantities, of a new, highly saturated storage fat. No fatty acid interconversions could be demonstrated, although there is some suggestion that oleic acid behaves anomalously. There is evidence that free fatty acids are not accumulated prior to esterification. [From author's summary.]—Univ. Southampton.

Pineapples.

(*See also* 4054, 4254d.)

4185. Nambiar, K. P. P.
A note on the method of raising pineapple suckers from stem slices and forcing their growth.
S. Indian Hort., 1955, **3**: 116-17.

The main stem is cut into sections each with 2–10 buds which are planted in nursery beds. Preliminary trials have shown that ½-in. slices gave more suckers than 1-in. slices. There were more buds in the upper part of the stem than in the lower part. Single stems of the variety Kew, 1–1½ feet long, gave rise to 8–25 suckers. Irrigation during the summer and monthly applications of ammonium sulphate and superphosphate from the 4th month onwards forced growth and allowed suckers to be set out 9 months after the slices had been prepared. —Agric. Res. Stat., Taliparamba.

4186. Peard, R. H., and Bader, C. J.
Pineapples. Preparation and planning of a pinery.
Fmg S. Afr., 1956, **32**: 62-7, illus.

Two methods of planting are described, viz. the short row system in which the rows are angled at about 30° down the slope between the permanent contour furrows, and the contour planting system in which the rows are planted parallel to the permanent contour furrows.—Pineapple Res. Stat., East London.

4187. Su, N. R.
Influence of soil fertility and plant nutrition on the yield and properties of pineapple fruits.
[Chinese, with English summary ½ p.]
J. agric. Ass. China, 1956, **13**: 57-65, bibl. 3.

Available soil K and leaf K were closely correlated with fruit compactness and yield. Soil K also affected fruit size but not significantly. Fruit size was related to the total amount of leaf K and nitrate concentrations. Fruit yields were also correlated with length and width of leaves in the season of rapid growth. Compact fruits were significantly heavier than loose-textured fruits of the same size.—Tou-liu Pineapple Exp. Stat., Taiwan Pineapple Corp.

4188. Sideris, C. P., and Young, H. Y.
Pineapple chlorosis in relation to iron and nitrogen.
Plant Physiol., 1956, **31**: 211-22, bibl. 35.

Pineapple plants grown in solution cultures with ample Fe contained more chlorophyll and produced greater plant and fruit weights than those in cultures with deficient Fe [see also *H.A.*, 26: 1165]. Chlorosis symptoms were similar in N-deficient and Fe-deficient plants. Chlorophyll, carotenoids and protein increased simultaneously in the green leaves of plants with Fe sufficiency but decreased in chlorotic leaves with Fe deficiency. Sugar concentrations in the proximal regions of the leaves with meristematic tissues were greater in chlorotic than in green leaves. Nitrogen intake and assimilation was greater in green than in chlorotic plants. Chlorophyll contents were correlated with Fe and N concentrations.—Pineapple Res. Inst., Honolulu.

4189. Gowing, D. P.
Some experiments on chemical induction of flowering in the pineapple.
From abstr. in *Plant Physiol.*, 1956, **31** (Suppl.): xxxiv.

Application of IAA to pineapple plants before flower induction by naphthaleneacetic acid, betahydroxyethylhydrazine or ethylene treatment delayed the appearance of the inflorescence. There was evidence of a competitive antagonism between NAA and IAA in the flowering response, and of a reaction (*in vitro*) between betahydroxyethylhydrazine and the naturally-occurring inhibitor of pineapple IAA oxidase.—Pineapple Res. Inst., Honolulu.

4190. Muzik, T. J., and Cruzado, H. J.
Effect of maleic hydrazide on pineapple.
Plant Physiol., 1956, **31**: 81, bibl. 3, illus.

Flowering of pineapples in response to low temperature was temporarily inhibited by 0·3% maleic hydrazide when the plants were treated about 20 days before flowering. Later treatment did not affect time of flowering or maturation but caused gummosis, distortion of the fruit and suppression of crown growth.—Fed. Exp. Stat., Mayagüez, P.R.

Rubber trees.

(*See also* 4233, 4254g, l, q, r, v, 4255a, b, j, l, m, s, v, 4264, 4269.)

4191. Rands, R. D., and Polhamus, L. G.
Progress report on the cooperative hevea rubber development program in Latin America.
Circ. U.S. Dep. Agric. **976**, 1955, pp. 79, bibl. 101, illus.

The report summarizes 14 years' work sponsored by the United States in 9 South American countries. It forms part of a rubber development programme aimed at creating a "living" stockpile of rubber within the U.S. defence zone. A major part of the work has concerned the propagation of clones resistant to leaf blight and the breeding of high-yielding, blight-resistant seedlings; some blight-resistant hybrids are also resistant to phytophthora leaf fall. Long-term cultural trials are briefly discussed.

4192. Paardekooper, E. C.
Results of hevea clone trials planted in 1926-1940 in the experiment gardens Tjiomas and Peweja. [Indonesian and Dutch summaries ¼ p. each.]
Arch. Rubb. Cult. Bogor, 1956, **33**: 1-59, bibl. 16.

Results of 1926–31 trials are summarized and those of 1934–37 trials, comprising 70 clones, are given in detail. Four comparatively new clones are recommended for small-scale planting. Details are also given of trials begun at Peweja in 1938.

4193. Paardekooper, E. C.
Results of the testing of hevea seedlings obtained by hand pollination during 1927-1944. [Indonesian and Dutch summaries about 1¼ pp. each.]
Arch. Rubb. Cult. Bogor, 1956, **33**: 61-139, bibl. 18.

Yield capacity and vigorous growth were largely transmitted from parent clones to offspring. Out of 20 clones used, 3 gave high-yielding offspring. Brown bast and tapping panel diseases were as common in seedlings as in buddings. Certain clones and seedlings are tentatively recommended for commercial planting and for use in breeding.

4194. Fink, K.
Sawdust and skim serum as a mulch.
Planter, 1956, **32**: 286-7.

Skim serum, obtained in latex concentrate production, was ammoniated to pH 7 and used as a liquid fertilizer over a 2-in. mulch of sawdust on nursery beds on a rubber estate. No other nitrogen was applied and 7 months after planting there was an even stand 6–7 ft. high. It is suggested that waste serum might be used to compost sawdust for mulch material.

4195. Paardekooper, E. C.
The occurrence, properties and possible application of juvenile type buddings. [Indonesian and Dutch summaries ¼ p. each.]
Arch. Rubb. Cult. Bogor, 1956, **33**: 141-57, bibl. 10.

Budding with stem buds of hevea seedlings only 1½ years old resulted in stems almost as tapering as those of seedlings and in very smooth unions between stock and scion. There is evidence that growth is more rapid than in mature-type buddings.

4196. Paardekooper, E. C.
Further data on early selection in hevea. [Indonesian summary 1 p., Dutch ⅔ p.]
Arch. Rubb. Cult. Bogor, 1956, **33**: 159-94, bibl. 4.

Neither prick tests nor microtapping gave results strongly correlated with yield data. Early selection leaving only 10% of the original material to be planted out gave yield increases of approximately 10–20%. There was some indication of correlation between the results of prick tests and counts of latex vessels in seedlings, but this may prove illusory when stem diameters are taken into account.

4197. Sandison, S.
The cultivation of leguminous covers.
Planter, 1956, **32**: 67-72, 190-5, bibl. 2.

The author advocates the use of a creeping leguminous cover for young rubber trees and that the plantation be treated as a rubber-legume community. In the first year the rubber and cover crop are manured separately, but afterwards the fertilizers are chosen and broadcast specifically for the cover crop. No inorganic N is used, and half of the P_2O_5 is applied as basic slag. A complete organic manure of animal origin with a high P content is applied in increasing amounts from the second year onwards. Weeding is essential before the cover crop is established. Competition between the cover crop and rubber is not regarded as serious. The legumes recommended are *Pueraria*, *Centrosoma* and *Calopogonium*.

4198. Rubber Research Institute of Malaya.
Is mature rubber undertapped?
Plant. Bull. R.R.I.M., 1956, No. 25, pp. 60-3, illus.

Double-cut tapping of older trees has resulted in increased yields. The second high cut was made at 55 inches above the first cut which was 35 inches above the union. Alternate daily tapping of clonal trees produced 1,740 lb./acre per annum in the first 18 months. The application of yield stimulants to double cuts on seedling trees resulted in further increases in yields. It is not yet known how long trees can endure tapping by the double cut system.

4199. Schoon, T. G. F., and Phoa, K. L.
Morphology of the rubber particles in natural latices. [Indonesian and Dutch summaries ⅓ p. each.]
Arch. Rubb. Cult. Bogor, 1956, **33**: 195-215, bibl. 22, illus.

The sources of material for phase microscopy were

Hevea brasiliensis, *Ficus nekbudu*, *Castilloa nicoyensis*, *Manilkara balata*, *Manihot dichotoma* and *Cryptostegia grandiflora*. With the exception of the last named, the latex particles were composed of smaller spherical particles.

4200. Teas, H., and Bandurski, R.
The enzymatic synthesis of rubber in *Hevea brasiliensis*.
From abstr. in *Plant Physiol.*, 1956, **31** (Suppl.): xxxvii-xxxviii.

Latex from hevea or the supernatant fluid following high speed centrifuging of latex incorporates labelled acetate into the rubber. Labelled pyruvate and beta-methylcrotonate were incorporated less easily.—U.S.D.A., Mayagüez, P.R., and Mich. St. Univ., E. Lansing.

Sugar cane.

(*See also* 3645-3648, 4254b, f, h, j, m, s, t, z, 4255g, k, t, w, y, z, 4256a, e.)

4201. Saint, Sir J.
The treatment of cane setts prior to planting.
Proc. 1954 Mtg B.W.I. Sugar Tech., Trinidad, pp. 121-2.

From the results of experimental work carried out in the British West Indies, it would appear that normally soil conditions at planting are sufficiently favourable to make treatment of setts prior to planting unprofitable. Under exceptional conditions, where the soil is too dry or too wet for rapid germination, dipping of setts in a solution of one of the organo-mercurial preparations would appear to be beneficial. [From author's conclusions.]—Sugar Tech. Res. Lab., Barbados.

4202. Yusuf, N. D., and Muhammad, W.
Seed sett germination in sugarcane.
Agric. Pakistan, 1955, **6**(4): 16-24, bibl. 18.

Germination of sugar cane setts of Co. 312, L.5 and L.29 was improved by soaking in cold water for 12–48 hours. Other treatments which improved germination were soaking in hot water for 30 minutes, in a cold, saturated solution of lime for 18 hours, or in a 0·1% solution of mercuric chloride for 6 hours. Soaking in a 1% HCl solution or in 1% potassium permanganate solution improved germination of L.5 and L.29, but adversely affected that of Co. 312. The percentage germination declined with late plantings. The germination percentage following "dry" planting (in dry soil followed immediately by irrigation) was almost double that following "wattar" planting (in 14-15% soil moisture). Applications of ammonium sulphate and of toria cake considerably improved sett germination, the effect being more marked with furrow applications. Germination of setts with more than 3 buds was poor. Placing the setts with the buds upwards gave the best germination. Germinating ability decreased from the top of the parent stalk downwards. A planting depth of 4–5 inches gave the best germination.

4203. Rao, M. S. S., Negi, N. S., and Khanna, K. L.
Use of organo-mercurial fungicide as sett treatment for sugarcane.
Curr. Sci., 1956, **25**: 159-60, bibl. 5.

Cane setts were dipped in various concentrations of Aretan for varying lengths of time and parallel series were dipped in water alone and given no treatment. Considerably improved germination resulted from the use of Aretan, the best results being given by setts quickly dipped in solutions of 4 oz. per 10 gal., but no significant increases in growth, yield or juice quality were shown.—Centr. Sugarcane Res. Stat., Pusa. J.R.L.

4204. Rao, J. T., and Ethirajan, A. S.
On methyl bromide as a plant fumigant.
Curr. Sci., 1956, **25**: 160-1, bibl. 5.

In experiments with cuttings of *Saccharum spontaneum* methyl bromide fumigation adversely affected initial germination, root formation and shoot growth. There were varietal differences.—Sugarcane Breed. Inst., Coimbatore. J.R.L.

4205. Knowles, W. H. C.
Experiments on modifications of standard cultivation practised in Barbados.
Proc. 1954 Mtg B.W.I. Sugar Tech., Trinidad, pp. 95-8.

In replicated field trials it was found that: (1) In plant cane close ploughing reduced yields as compared with "ploughing two cuts to the bank". (2) The site in which the new cane holes were dug, in relation to former plantings, had no influence on the yield of cane. (3) The application of bagasse was beneficial, but no consistent differences resulted from various methods of applying or incorporating it. (4) In the plant cane crop slight advantages were obtained by furrowing and also by cane-holing as compared with flat planting. (5) In general plots mulched with sour grass tended to outyield unmulched plots.—Dep. Agric., Barbados. J.R.L.

4206. Evans, H.
Some preliminary results from field trials designed to test the value of various cultural practices under British Guiana conditions.
Proc. 1954 Mtg B.W.I. Sugar Tech., Trinidad, pp. 87-95.

From a series of trials to test the effects of various cultural practices it is concluded that: 1. Weed control by spraying with 2,4-D combined with inter-row forking was superior to the control obtained by spraying alone or by hand-weeding alone or combined with inter-row forking. 2. Mechanical inter-row cultivations, which involve any large disturbance of the soil, result in decreases of cane and sugar yields of about 10%. 3. Superphosphate applied to ratoon crops did not increase yields if deep cultivations were also practised. 4. The vegetative growth index and leaf analysis showed responses to applications of P, whether these were combined with a bagasse mulch or not. 5. The P content of the leaves, but not the K content, was increased by dressings of bagasse ash. 6. There appeared to be a yield response to applications of rock phosphate and molasses. 7. Variable results were obtained from bagasse plus N applications. 8. Foliage applications of sulphate of ammonia were not significantly better than soil applications. 9. No advantage was gained by using "pineapple row spacing" (double rows 18 in. apart with 4½ ft. interlines) compared with ordinary single rows spaced 6 ft. apart.—Bookers Sugar Estates Ltd., B.G. J.R.L.

4207. Yusuf, N. D., and Muhammad, W.
Studies into the cultural aspects of sugar-cane.
From abstr. in *Proc. 6th Pakistan Sci. Conf., Karachi, 1954, Part III*, pp. 24-7.

(I) *Time of planting.* At the Sugarcane Research Station, Lyallpur, planting at the beginning of March at 30,000 setts per acre produced the highest cane yield. Planting from the middle of March to the middle of April resulted in progressive falls in yield. Early March planting at about 50,000 setts per acre also resulted in reduced cane yields, but late planting at the increased rate gave higher yields. Early planting resulted in richer juice than late plantings. (II) *Method of planting.* The 2 general methods of planting in the Punjab are planting in "wattar", i.e. in soil containing 14–15% moisture, and planting dry, i.e. in dry soil followed by immediate irrigation. From the results of trials it is suggested that when planting is done late fresh, unsoaked setts and the dry method of planting should be used, whereas when planting is done early, i.e. in March, soaked setts with "wattar" planting would seem more suitable. (III) *Inter-row spacing.* In comparisons between inter-row spacings ranging from 1 to 4 ft. the highest yields were obtained with 2 ft. spacing. (IV) *Seed rate.* Treatments consisted of rates ranging from 25,000 to 40,000 setts per acre, both soaked and unsoaked. The highest cane yields were given by 40,000 setts in both March and April plantings. Soaking seemed to have a favourable effect on germination and on final yield and juice quality. (V) *Preparatory tillage and interculture.* Three different methods of land preparation did not seem to have appreciably different effects on germination, tillering or final yield. Intercultivation with bullocks resulted in damage to tillers and depressed yields as compared with hand hoeing. (VI) *Earthing up.* Earthing up 4 months after planting, i.e. in July, was most beneficial to the crop under liberal conditions of manuring and irrigation, but had little effect on yield when irrigation and manuring were restricted.

4208. Cruz, S. R., and Inciong, R. A.
Mechanized vs. carabao method of sugar production.
Araneta J. Agric., 1955, 2(4): 12-15.

Data from 72 farms showed on analysis that significant increases in yield were obtained by mechanized methods of land preparation and cultivation.—Dep. Agric. Engng, Araneta Inst. Agric.

4209. Birkett, L. S., and Bourne, C. L. C.
A study of plant analysis methods for determining the nutrient requirements of the sugar cane in British Guiana.
Proc. 1954 Mtg B.W.I. Sugar Tech., Trinidad, pp. 76-83, bibl. 23.

From juice and leaf analyses of canes from many fertilizer trials, involving applications of N, P, K and Ca at various levels, alone and in combination, the following conclusions are drawn: (1) On different soils the application of any one nutrient may result in varying uptake by the plant of that and other nutrients. (2) There is a relatively constant and characteristic ratio in the level of P_2O_5 in juices of cane varieties grown on the same soil. (3) There is a relationship between the P_2O_5 content of the crusher juice of a cane variety and the content of available P_2O_5 in the soil. (4) The P_2O_5 content of the crusher juice appears to be a suitable means of determining whether a soil will respond to applications of P_2O_5. (5) Applications of sulphate of ammonia depress the P and increase the Mg content of the juice and applications of limestone increase the uptake of P and K. (6) The most suitable period for sampling canes for nutrients is at 10 to 12 weeks for ratoons and at 16 to 18 weeks for plant canes.—Dep. Agric. and Davson Ltd., B.G. J.R.L.

4210. Evans, H., and others.
Investigations on the mineral nutrition of sugar cane in British Guiana. Part I: The results of some factorial fertilizer trials in plant cane.
Proc. 1954 Mtg B.W.I. Sugar Tech., Trinidad, pp. 13-59.

Detailed results are given of vegetative growth, mineral analysis of leaf samples, yield of sugar cane and sucrose % cane in 15 factorial fertilizer experiments with N, P and K applied at 3 different rates, with and without Ca. N was supplied as 0, 4 and 8 cwt. sulphate of ammonia, P as 0, 4 and 8 cwt. superphosphate, K as 0, 3 and 6 cwt. muriate of potash and Ca as 0 and 6 tons limestone. Yield responses to N were general, whereas those to P and K varied. K often showed a strong interaction with N and P, depressing yields when the supply of these two elements was insufficient but having a positive effect when they were in adequate supply. In soils low in Ca, limestone facilitated the intake of N, P and K with a result that under some conditions maximum cane yields were obtained both by applying single N, P, K dressings with limestone and by using double N, P, K dressings without it. Data were obtained by foliar analyses on the critical values of N, P, K, Ca and Mg for maximum yield in plant cane, but were not very satisfactory in the case of N. There was a positive correlation between N and Ca and between N and Mg, and a negative correlation between K and Mg. The sucrose content of the cane was reduced more by increasing dosages of N when Ca was also applied than when Ca was absent. In general juice quality was best in the plots receiving the first level of all 3 fertilizers. K improved quality in trials in which there was a growth response to K, but in other cases neither this element nor P had an appreciable effect on quality.—Bookers Sugar Estates Ltd., B.G.
J.R.L.

4211. Evans, H.
Field responses to complete fertilizer applications in British Guiana.
Proc. 1954 Mtg B.W.I. Sugar Tech., Trinidad, pp. 83-7.

The results are summarized of 46 field trials designed to determine whether both plant and ratoon canes, which appeared to have an inadequate K and often inadequate Ca status, would respond economically to moderate dressings of these elements. The results show that the increased yield of sugar per acre from the spring crop was sufficient to have paid for the extra amendments in that crop, even though many of the fields had been subjected to severe drought during the previous autumn.—Bookers Sugar Estates Ltd., B.G. J.R.L.

4212. Locsin, C. L., Tabayoyong, F. T., and Lacson, M. V.
Variety and fertilizer tests.
Sugar News, 1956, **32**: 179-85.

Yields of 6 cane varieties in response to 4 fertilizer treatments were studied. H44-3098 gave significantly better cane and sugar yields than the other varieties. An 80–80–120 fertilizer treatment gave significantly lower yields than the 3 other treatments. No significant differences were found between the other treatments given, but the 180–120–180 fertilizer was the most profitable.

4213. Locsin, C. L., Tabayoyong, F. T., and Ferraris, I. P.
Fertilizer test on CP 29/116 (plant crop).
Sugar News, 1956, **32**: 175-8.

Three kinds of ammophos and one complete fertilizer were supplemented with ammonium sulphate and/or muriate of potash to give the same contents of N, P_2O_5 and K_2O. Plots receiving 11–48–0 gave the highest sugar yield but differences were not significant.

4214. Yusuf, N. D., and Muhammad, W.
Studies into the effects of fertilizers on the quality of sugarcane juice.
From abstr. in *Proc. 6th Pakistan Sci. Conf., Karachi, 1954, Part III*, p. 22.

In experiments at the Sugarcane Research Station, Lyallpur, groundnut cake, cotton-seed cake and toria [rape-seed] cake were applied to cane, with and without F.Y.M., in amounts ranging from 0 to 150 lb. N per acre. P, K and Ca were also applied. N had an adverse effect on juice quality only in the early stages of maturity, and later matured plots yielded richer and purer juices. Ripening was slightly delayed by N, especially when applied as groundnut cake. The combination of cakes with F.Y.M. gave richer juice. The experiments did not show any marked effects of P, K and Ca either on juice quality or time of maturity.

4215. Muhammad, W., and Yusuf, N. D.
Response of some of the new varieties of sugarcane to different conditions of manure and irrigation.
From abstr. in *Proc. 6th Pakistan Sci. Conf., Karachi, 1954, Part III*, p. 23.

Experiments were conducted with the 4 new varieties L.5, L.9, L.29 and K.30 developed at Lyallpur, and the standard cane Co. 312, using 2 nitrogen levels, 70 lb. and 140 lb. per acre, and 2 moisture levels. It was found that L.29 and L.5 have higher requirements for both N and water supply than the other 3 varieties. The varieties L.9 and K.30 showed a better response to increased irrigation than to high N supply, and liberal irrigation favoured both cane yields and juice quality. Co. 312 seemed to respond more to manure than to irrigation, and in this case liberal irrigation had a slightly adverse effect on juice quality.

4216. Yusuf, N. D., and Muhammad, W.
Studies into the time of application of ammonium sulphate on sugarcane.
From abstr. in *Proc. 6th Pakistan Sci. Conf., Karachi, 1954, Part III*, p. 24.

Results of large-scale experiments carried out at Lyallpur during 1950 to 1953 showed that the application of ammonium sulphate at planting increased germination by about 20%. It also gave the highest yields in almost all the varieties studied. The cane yields per acre obtained from the application of the entire dose 3 months after planting and in divided doses, i.e. $\frac{1}{3}$ at planting, $\frac{1}{3}$ 3 months later and $\frac{1}{3}$ 6 months later, were about equal, but were significantly less than those obtained from the application of the whole dose at planting. Late application, i.e. in the 6th month or later, gave the lowest yields and had a depressing effect on the sugar content and juice purity.

4217. Obaidullah Jan, M.
The comparative effect of various forms of nitrogen at different levels on the yield and sugar content of sugar cane.
Agric. Pakistan, 1956, **7**: 11-19, bibl. 11.

Data are presented from 5 experimental crops, to which 6 forms of N were applied at 4 rates, namely 50, 100, 150 and 200 lb./acre. Yields increased with increasing N levels up to 100 lb./acre. Increasing N adversely affected the c.c.s. Source of N had little or no effect on yields or sucrose contents.

4218. Obaidullah Jan, M., and Palmer, A. E.
The effect of different nitrogen levels on the yield and sugar content of sugar-cane—I.
Agric. Pakistan, 1956, **7**: 43-6, bibl. 6.

Increasing doses of N were applied as ammonium sulphate to the plant crop and 2 successive ratoons. In the plant crop cane yields and c.c.s. rose with increases of N from 70 lb. to 110 lb. per acre. In the first ratoon improved juice quality and increased cane yields were obtained at levels of N up to 130 lb. per acre. In the second ratoon yields were rather less, but were increased with increasing N; in this crop higher doses also improved juice quality.

4219. Singh, S.
Manuring of sugarcane in Malwa.
Madras agric. J., 1955, **42**: 435-41, bibl. 5.

In a manurial trial with Co. 419, farmyard manure and farm compost were applied as basal dressings, providing 50 lb. N per acre, and ammonium sulphate with groundnut cake or castor cake was applied as top-dressings varying from 50 to 200 lb. per acre. No marked differences in yield were observed between the types of organic manures applied. Maximum yields were obtained by an application of 150 lb. N per acre.—Inst. Plant Ind., Indore.

4220. Locsin, C. L., Guillermo, R. J., and Tabayoyong, F. T.
Potash fertilization tests on sugar cane in the Victorias district—a review.
Sugar News, 1956, **32**: 69-84, bibl. 21.

Significant increases in cane and sugar yields were obtained from potash fertilization where the available soil K was less than 95 p.p.m. Results were variable where available soil K was between 95 and 120 p.p.m. No significant increases in crop yield were obtained at soil K levels above 120 p.p.m. The residual effect of potash was reflected in significant increases in cane and sugar yields in the succeeding ratoon crops. Liming did not reduce the availability of potash applications, but higher potash doses were required in previously-limed soils. Potash requirements in deficient soils were confirmed by foliar analysis. In some tests canes fertilized with potash were found to be more resistant to breakage and rat damage and showed lower stalk mortality than did unfertilized canes.—VMC Exp. Stat.

4221. Lines, G. T.
Some factors affecting yields of sucrose per acre.
Proc. 1954 Mtg B.W.I. Sugar Tech., Trinidad, pp. 59-75, bibl. 3.

An examination of field records in British Guiana revealed differences in sugar yields, which could not be ascribed to variety or to soil variations. All the factors measured in the investigations reported here have shown the predominant influence exerted by the weather. Cane growth is reduced after variable periods with a rainfall of less than 1 in. per week. During such dry spells sucrose may increase for about 3 months but thereafter the increase may cease. Sucrose decreases rapidly after the onset of rains and over 4 months may elapse before it again reaches its previous maximum. No evidence was found of deterioration due solely to age of cane at reaping. Flowering did not seem to detract from sucrose in the cane nor from weight in individual canes. Ratoons generally produced more stalks than plant canes, but the latter produced a higher maximum of millable cane per acre.—Bookers Sugar Estates Ltd., B.G. J.R.L.

4222. Thompson, H. A., and Floyd, F. J.
Irrigation studies at Monymusk with particular reference to the use of gypsum resistance units.
Proc. 1954 Mtg B.W.I. Sugar Tech., Trinidad, pp. 107-11.

After several years' experience using gypsum resistance units in irrigation trials [see also *H.A.*, 24: 3224] the authors consider them to be of considerable practical assistance. The units they have made have a resistance close to 2·1 log-ohms in soil at field capacity. When the units reach a resistance, on the average, of 2·4 log-ohms, the soil moisture tension is about 1 atmosphere and the growth of cane is being limited by lack of water.—W. Indies Sugar Co. Ltd., Jamaica. J.R.L.

4223. Muhammad, W., and Yusuf, N. D.
Studies into the effect of irrigations on the quality of sugarcane juice.
From abstr. in *Proc. 6th Pakistan Sci. Conf., Karachi, 1954, Part III*, p. 23.

It was observed that profuse supply of water during the pre-monsoon period resulted in juice with high sucrose, high purity, low reducing sugars and low mineral matter. Deficient supply of water during this period gave a juice of low sucrose percentage, low purity, high reducing sugar content and high percentage of mineral matter. Irrigation of cane-fields every ten days in the pre-monsoon period and then at monthly intervals during the post-monsoon period resulted in cane juice with high sucrose and high purity. Liberal irrigation during both pre-monsoon and post-monsoon periods resulted in low sucrose and purity. Restricted irrigations throughout the growth period gave low sucrose percentage in the cane juice and low purity. Restricted irrigation in pre-monsoon period accompanied by liberal irrigation during monsoon or post-monsoon period yielded cane juice of high purity but low in sucrose percentage.—Sugarcane Res. Stat., Lyallpur.

4224. Rao, N. V. M., and Rao, G. R.
Reducing the cost in sugarcane.
Indian Fmg, 1956, 6(1): 34-5, illus.

In parts of Andhra State cane is commonly propped to prevent lodging by severe winds. Two methods of reducing the cost of propping are described: (1) Planting the cane in trenches 12 inches deep improves anchorage, and also minimizes weeding, irrigation and propping expenses. (2) Twists of cane trash are used in 2 tiers to hold 2 adjacent cane rows together.

4225. Khan, A. M.
Possibilities of sugarcane flowering in Sind.
From abstr. in *Proc. 6th Pakistan Sci. Conf., Karachi, 1954, Part III*, p. 1, bibl. 3.

In the south Sind sugar cane flowers freely. During a study in 1950-1951 it was observed that the pistillate flowers were quite healthy and receptive, but that the staminate flowers, while fully developed, had practically no pollen. Methods of inducing flowering and pollen production are considered.—Agric. Res. Stat., Sakrand.

4226. Hutchinson, P. B., and Wise, W. S.
The effect of chlorotic streak disease on sugar yields in Trinidad.
Proc. 1954 Mtg B.W.I. Sugar Tech., Trinidad, pp. 122-5, bibl. 2.

In Trinidad infection with chlorotic streak disease reduces germination of planting material of variety B.4362 by about 25%. Germination may be brought to normal level by treating in water at 50° C. for 15 minutes and the disease is eliminated by a treatment of 52° C. for 20 minutes. Infected B.4362 yielded approximately 28% less millable cane than the same variety when disease-free, but the purity of the juice from diseased cane was significantly higher than that from healthy cane. The overall result of infection was a loss of approximately 10% sugar. [Authors' summary.]—Imp. Coll. Trop. Agric., Trinidad. J.R.L.

4227. Bates, J. F.
The status of moth borer in British Guiana.
Proc. 1954 Mtg B.W.I. Sugar Tech., Trinidad, pp. 126-36, bibl. 8.

From a survey of the damage done by *Diatraea* spp. on 9 sugar estates the economic losses due to them are considered to be over $1 million per annum. The pest has not increased in recent years; *D. canella* is now more common than *D. saccharalis*. Parasitism by the Amazon fly *Metagonistylum minense*, was lower than in previous surveys, probably due to the smaller population of borers. *Trichogramma minutum* and *Palpozenillia palpalis* are considered promising parasites. Control by insecticide applications is impracticable under British Guiana conditions.—Bookers Sugar Estates Ltd., B.G. J.R.L.

4228. Latif, A., and Akhtar, M. M.
Susceptibility of some new varieties of sugarcane to the attack of borers.
From abstr. in *Proc. 6th Pakistan Sci. Conf., Karachi, 1954, Part III*, pp. 46-7.

Sugar cane in the Punjab suffers heavily from infestations of top borer (*Scirpophaga nivella*), shot borer (*Argyria sticticraspis*) and root borer (*Emmalocera depresella*). Eight new varieties developed at Lyallpur were tested for their susceptibility to these borers. A statistical analysis of experimental results showed that the variety K.30 was damaged less by the borers, L.44, L.43, L.37 and L.38 were damaged slightly more, and L.33, L.36 and L.29 were damaged significantly more than the standard control variety Co. 312.—Punjab agric. Coll. and Res. Inst., Lyallpur.

4229. LATIF, A., AND AKHTAR, M. M.
Record of gram cut-worm (*Agrotis flammetra* Fab.) on sugarcane and its control.
From abstr. in *Proc. 6th Pakistan Sci. Conf., Karachi, 1954, Part III*, pp. 56-7.

Three insecticidal treatments were applied to sugar cane for the control of gram cut-worm. The results showed that 0·26% BHC dust acted rapidly and gave 100% mortality within 36 hours; DDT at 5% had a rapid initial action but killed only 87·0% of the worms; and a sodium fluosilicate bait killed 54·6% of the cut-worms initially and up to 76·3% after a period of time.—Punjab agric. Coll. and Res. Inst., Lyallpur.

4230. BLACKBURN, F. H. B.
Further developments in froghopper control.
Proc. 1954 Mtg B.W.I. Sugar Tech., Trinidad, pp. 137-40, bibl. 6.

It appears that 3% malathion will control BHC-resistant froghoppers, both nymphs and adults, and it is highly probable that diazinon will be equally effective at a lower concentration. [From author's conclusion.] —Caroni Ltd., Trinidad. J.R.L.

4231. LATIF, A., AKMAL, M. M., AND AKHTAR, M. M.
Field trials of endrin against sugarcane leafhopper (*Pyrilla* sp.).
From abstr. in *Proc. 6th Pakistan Sci. Conf., Karachi, 1954, Part III*, p. 56.

Spray applications to sugar cane of 0·01% (0·3 lb./acre), 0·02% (0·5 lb./acre) and 0·03% (0·7 lb./acre) solutions of endrin resulted in 54·7, 87·8 and 98·2% mortality of leafhopper nymphs and 65·6, 96·5 and 100% mortality of adults, respectively, within 48 hours.—Punjab agric. Coll. and Res. Inst., Lyallpur.

4232. HUTCHINSON, P. B., WIGGINS, L. F., AND WISE, W. S.
The fibre structure of cane varieties B37161 and B4362.
Proc. 1954 Mtg B.W.I. Sugar Tech., Trinidad, pp. 165-7, illus.

Some differences found in the fibre structure of the two varieties are described. B.4362 has a smaller area at the nodes covered by fibres than B.37161. The average fibre size of B.37161 is greater in the nodes than in the internodes, whereas the reverse is true of B.4362. With these two varieties the differences are small, but with other varieties they may be large enough to affect milling characteristics.—I.C.T.A., Trinidad. J.R.L.

Tea.

(*See also* 3649, 4254u, x, y, 4255q, x, 4256c.)

4233. UNITED PLANTERS' ASSOCIATION OF SOUTHERN INDIA.
Annual Administration Report, United Planters' Association of Southern India, Scientific Department (Tea Section), for 1953-1954, pp. 24.

Blister blight: In fungicide screening trials, Perenox, Fernasul, colloidal copper and ICI 6% dust (YF.3105) gave effective control. *Entomology:* Purple mite (*Eriophyes carinatus*), which is a more serious pest than red spider, was not satisfactorily controlled by Chlorocide. *Botany:* Growth of root-infecting fungi was depressed by DD in pure culture, but fumigants had little effect in the field. *Rubber:* Abnormal leaf-fall caused by *Phytophthora palmivora* may be prevented by applying copper dusts.

4234. VENKATARAMANI, K. S.
Some salient features of the work of the Botanical Section of the U.P.A.S.I. Tea Experiment Station.
Proc. 4th annu. Conf. U.P.A.S.I., 1956, pp. 27-36, bibl. 6.

Pathology: the occurrence of physiologic races of *Exobasidium vexans* has been observed. *Physiology:* foliar application of both K_2O and an NPK mixture have significantly increased yields of debilitated bushes. The response to spraying was highest during the dry period of January to March. *Propagation:* polythene film covers were used to maintain high humidity conditions in pots in which tea cuttings were set in a clay-loam soil; root initials were observed 7 weeks later.

4235. SIMURA, T., AND INABA, T.
Studies on polyploidy of the tea plant.
[Japanese, with English summary ½ p.]
Bull. Tea Div. Tôkai-Kinki agric. Exp. Stat., 1953, No. 1, pp. 1-14, bibl. 19, illus.

Several morphological and physiological characters of triploid and diploid varieties were compared. No differences were observed in disease resistance, total N and tannin content in summer, reduced vitamin C content in winter or in the ability of cuttings to regenerate. Triploid varieties were hardier than diploids.

4236. HUME, P. F.
Storage of tea seed.
Tea Quart., 1955, **26**: 93-5.

Tea seed in wooden paper-lined boxes was successfully stored at 40° F. for periods up to 6 months without loss of viability. The germination of stored seed which sank when placed in water was 99·5%, while that of "floaters" was 85%.

4237. GIGIBERIJA, Š. S.
Use of sloping land for tea cultivation.
[Russian.]
Agrobiologija, 1956, No. 1, pp. 108-23, illus.

A general discussion on tea growing on slopes is followed by the results of trials conducted to ascertain which of 5 methods of terracing sloping land, commonly used in Russia and abroad, is the most suitable. It was found that tea grown on partially levelled bench terraces with a forward slope gave higher yields than that grown on one type of wide and two types of narrow bench terrace with reverse slopes or on unterraced hillsides with contour drains. Soil management on the best type of terrace is described with special reference to erosion control.

4238. PERERA, S. S.
Gotukola—as a cover crop for tea.
Tea Quart., 1955, **26**: 148-9.

The author disputes the view that gotukola (*Hydrocotyle asiatica* or *Centella asiatica*) competes with tea, when grown as a cover crop.

4239. MACALPINE, R. I.
Stylosanthes gracilis as a green crop in tea.
Two and a Bud, 1955, **2**(4): 2-4, and *World Crops*, 1956, **8**: 260-2.

Observations on the establishment and growth habits of *S. gracilis* in the Darjeeling district suggest that it may be useful as a ground cover for young tea. In mature tea it may be expected to push upwards into the bushes. It has not yet, however, been tested in tea in this area.—Tocklai exp. Stat., Cinnamara, Assam.

4240. SIMURA, T., AND NAKAYAMA, A.
Flowering and fruiting habit of the tea plant. [Japanese, with English summary 1 p.]
Bull. Tea Div. Tôkai-Kinki agric. Exp. Stat., 1953, No. 1, pp. 15-29, bibl. 10, illus.

Flowering and fruiting were studied in 3 varieties of tea. The physiological condition of the branch affected the position of the flower buds. Both axillary and terminal buds were formed on branches which did not grow after June and on those which had two growing periods. Axillary buds only were formed on branches which continued to grow throughout the growing season. The flowering curve of each branch showed the order of flowering to be, first the terminal bud of branches growing until June, then the buds of the lower part of the branch with 2 growing periods, followed by the axillary buds of the continually-growing shoot. Finally the terminal and axillary buds of the upper part of the shoot with 2 growing periods flowered. The flowering period of the variety U-12 was longer than that of A-5 or of C-5. Fruit drop started soon after flowering and continued until August in the following year. Two periods of maximum fall were observed, the first about 1–2 months after flowering and the second in the following April or May. In U-12 flowers opening before September showed a low percentage of fruit set. Flowers of A-5 and C-5 opening after the end of November had a low fruit set.

4241. TORII, H., AND OTHERS.
Environmental variations in the chemical constituents of tea leaf. [Japanese, with English summary 2½ pp.]
Bull. Tea Div. Tôkai-Kinki agric. Exp. Stat., 1954, No. 2, pp. 164-86, bibl. 3.

Tea leaf was collected from bushes of Yabukita (grown for green tea) and Benihomare (grown for black tea) growing in 3 districts during 3 plucking seasons. Soluble N, caffeine, crude fibre and crude ash were highest in 1950 and lowest in 1951, while tannin and alkalinity of ash showed an opposite trend. Total N, insoluble N and caffeine-free soluble N were lowest in 1949. Yabukita was rich in insoluble N constituents while Benihomare was richer in soluble N. The ratio of caffeine-free soluble N to total soluble N or to hot water extract was higher in Yabukita, and the content of caffeine-free soluble N and its ratio to hot water extract were markedly lower in the summer than in the spring crop. Benihomare contained more tannin and hot water extract, and had a higher tannin/hot water extract ratio. Ash content and its alkalinity were most affected by regional differences in soils. Nitrogenous constituents, except caffeine and the ratios of N fractions with each other showed no significant differences. Leaf grown in the Kagoshima district was characterized by much crude fibre and low crude ash and alkalinity, and the ratio tannin/hot water extract was higher than in leaf from the other 2 districts. This difference between districts in the ratio was small in the spring crop but became higher in the summer crop. Relations between soil components and the ash of tea leaves or its alkalinity were only significant for soil Fe/leaf ash and soil Al/alkalinity of leaf ash. Distinct seasonal differences between spring and summer crops were observed. Spring shoots grew longer than summer ones, and generally shoots plucked from longer shoots were heavier. Shoot length was positively correlated with N fractions and negatively correlated with tannin.

4242. ZEEHUISEN, J. J.
Ringschluss von Zuckern und Gerbstoffsynthese im Teeblatt. (**Ring closure of sugars and the synthesis of tannin in tea leaves.**)
Hemera Zoa, 1956, **63**: 129-67, from *Trop. Abstr.*, 1956, Vol. **11**, abstr. d1525.

Biochemical tea research in the Soviet Union has brought to light that the formation of "meso-inositol" from glucose is the first step in building up the catechins in the tea leaf. The quality of tea is strongly influenced by the reactions between catechins and amino acids after consumption of the sugar in the leaf. The research on the ring closure of sugars is of general importance for biochemistry. The pharmacological effect of tea, especially its anti-scorbutic effect, is considered highly important.

4243. NAGATA, T.
Studies on anthracnose of the tea plant. [Japanese, with English summary ¾ p.]
Bull. Tea Div. Tôkai-Kinki agric. Exp. Stat., 1954, No. 2, pp. 97-131, bibl. 27.

Measures which promoted the spread of anthracnose (*Gloeosporium theae-sinensis*) were heavy rain, K deficiency and hand plucking. Japanese tea strains were much more susceptible to the fungus than were foreign strains, the leaves of which had thicker cuticles and contained more tannin. In resistant varieties the gallic acid content of the leaf increased in response to invasion by the fungus, and it is thought that this compound may play a part in preventing invasion. Bordeaux, a copper-mercurial fungicide and zineb were equally effective as preventive sprays.

4244. NAGATA, T., AND KIBUSHI, H.
Control effects of some fungicides on tea blights and their influence on the quality of tea. [Japanese, with English summary 1 p.]
Bull. Tea Div. Tôkai-Kinki agric. Exp. Stat., 1954, No. 2, pp. 65-96, bibl. 6.

Sprays of bordeaux, copper-mercurial wettable powder and zineb gave successful control of white spot, anthracnose [*Gloeosporium theae-sinensis*] and bacterial disease on tea. White spot was also controlled by captan, Phygon and ziram, the first two materials being also effective against anthracnose. The copper content of green tea made from copper-sprayed leaves did not exceed the legal limit when sprays were applied 25 days before plucking. Tea made from leaves sprayed with captan, ferbam, ziram or Phygon had an undesirable smell, and these compounds should not be applied within 25 days of plucking.

4245. MINAMIKAWA, J., AND SAITO, T.
Influence of insecticidal sprays and dusts on the tea plant and tea quality. Part 1. [Japanese, with English summary 1½ pp.]
Bull. Tea Div. Tôkai-Kinki agric. Exp. Stat., 1953, No. 1, pp. 30-76, bibl. 14.

Tea quality was not adversely affected by applications of pyrethrum, DMDT (methoxychlor), chlordane, R-242 (p-chlorophenylphenyl sulphone) or TEPP. Spray materials not recommended for use in tea gardens are acid lead arsenate, calcium arsenate, DDT and BHC. Results with the other chemicals tested were as follows: Kerosene emulsion plus pyrethrum was safe if applied over 25 days before plucking; tea had a peculiar smell when tobacco dust was applied 12 days before plucking; nicotine sulphate and liquid lime-sulphur had variable effects; and sodium and potassium fluosilicates and cryolite generally had no adverse effects on quality.

4246. ANANDA RAU, S.
Flushworm.
Proc. 4th annu. Conf. U.P.A.S.I., 1956, pp. 14-20.

Two spray applications were given to tea bushes attacked by larvae of *Cydia leucostoma*. A reduction in infestation became apparent by the third plucking, where bushes had been treated with 2 formulations of malathion or DDT. Control was effective for about 3 weeks after spraying.

4247. BAPTIST, B. A., AND RANAWEERA, D. J. W.
The scarlet mites of the genus *Brevipalpus* as pests of tea in Ceylon.
Tea Quart., 1955, **26**: 127-37, bibl. 16, illus.

The biology of the *Brevipalpus* species is described. Cultural methods of reducing *Brevipalpus* populations are pruning, resting, and shade management. Acaricidal trials with sulphur, Chlorobenzilate and Karathane showed that 3 or 4 applications were necessary for effective control. A light application from above was relatively ineffective in reducing mite populations on tea in plucking. Dusting was generally less effective than spraying.

4248. KEEGEL, E. L.
The outturn of made tea to green leaf (theoretical and practical considerations).
Tea Quart., 1955, **26**: 138-47.

For practical purposes the ratio dry matter: fresh weight represents the outturn of made tea to green leaf. The author discusses data obtained at St. Coombs which throw light on the main factors responsible for the considerable variations that occur in the moisture content of freshly plucked leaf, namely, the proportions of leaves and stalks, the weather, and age from pruning. Other factors relating to manufacture, which also affect outturn, are discussed briefly. In general, the figures available suggest that the annual outturn of the average estate is unlikely to vary much from 22 to 23%, although the extremes of daily outturn may range from 17 to 29%.

Sundry crops.

(*See also* 4255h, o, p.)

4249. RAMAKRISHNAN, T. S.
Sunscorch in areca.
Proc. Indian Acad. Sci. Sect. B, 1956, **43**: 258-63, bibl. 4, illus.

Areca catechu is cultivated extensively in Madras, Mysore, Travancore-Cochin, Bombay, West Bengal and Assam, particularly in S. India. Among diseases to which it is prone are a fruit and bud rot due to *Phytophthora palmivora*, wilt due to *Ganoderma lucidum* and "band", a physiological disorder. Recently another form of disorder consisting of splits, cracks and depressions in the stem or cavities of the stem has become noticeable. Observations show that only palms exposed to the sun show symptoms. Fungi often infect the cracks but are not responsible for the original condition, nor is scorching by bordeaux. Exposure to the hot afternoon sun and consequent scorching is the prime cause. Provision of adequate shade by planting of such trees as coconut, jack, *Artocarpus hirsuta*, casuarina, etc., in several staggered rows to give shade is recommended. When palms are in the initial stages of sunscorch damage all affected tissues should be removed and the exposed surface painted with a fungicide and coated with some water-proofing substance.

4250. ANON.
Consolidated report with experimental details and results on stem-breaking disease of areca palm in South Kanara.
Arecanut J., 1956, **7**(1): 3-8.

Investigations on the breaking of areca palm stems during strong winds suggest that sun scald is a primary contributing factor. No correlation was found between the incidence of breaking and stem girth. Spray applications of bordeaux mixture did not appear to affect incidence. Treatment with chemicals did not prevent the spread of wood-rotting fungi. Painting the stem with zinc white paint was helpful in preventing scorch but attracted insect borers. The application of urea sprays had no beneficial effect on stem breaking. Investigations in progress on other disorders of areca palms are also mentioned.

4251. RAO, V. N. M.
Multiply the better-yielding cashewnut.
Indian Fmg, 1956, **6**(3): 15-17, illus.

High-yielding cashew trees capable of producing over 200 lb. of nuts a year may be successfully propagated by air-layering with the aid of polythene. The method used at the Cashew Research Station in Mangalore is described and clearly illustrated.

4252. SOUBIHE, J., AND OTHERS.
Vitamina C em "cabeludinha" (*Myrciaria glomerata* Berg.). (**Vitamin C in *Myrciaria glomerata*.**) [English summary ½ p.]
Bragantia, 1955, **14**: 193-201, bibl. 9.

Average vitamin C content of fresh fruits from three fully insolated trees was 2,376 mg. per 100 g. Values were higher in green than in ripe or nearly ripe fruits, and were higher in the pulp than in the skin. Ripe fruits on shaded trees were much poorer in vitamin C than those on trees exposed to the sun. *Myrciaria glomerata* is the richest in vitamin C of all edible myrtaceous fruits.

4253. Malavolta, E., and others.
Ascorbic acid content in fruits of *Myrciaria glomerata* Berg.
Nature, 1956, **178**: 424, bibl. 1.

Figures of the vitamin C content of green, fully developed and ripe fruits of *M. glomerata* show that these have the highest vitamin C content of the family Myrtaceae, and, as regards other families, are only surpassed in this respect by wild rose hips and *Malpighia* fruits. The pulp is richer than the peel.—E.S.A. Luiz de Queiroz, Piracicaba, and Inst. agron. Campinas, S. Paulo, Brazil.

Noted.

4254.

a do Amaral, S. F.
Porque BHC com mais de 1% no contrôle do bicho mineiro? **(Why use BHC at more than 1% against *Leucoptera coffeella?*)**
Biológico, 1956, **22**: 39-47, bibl. 8, illus.
Kills caused by 0·5, 1·0 and 1·5% dusts were similar.

b Anderson, J.
Droopy top in cane.
Cane Grs' quart. Bull., 1956, **19**: 146-8, illus.
A bad case described; possible cause Cu and Zn deficiency.

c Anon.
Un ennemi dangereux du bananier *Cosmopolites sordidus*. **(A dangerous pest of bananas, *Cosmopolites sordidus*.)**
Bull. Inf. INEAC, 1956, **5**: 103-11, illus.
Including control measures applied in several countries.

d Anon.
Pineapples. Select good planting material.
Fmg S. Afr., 1956, **32**: 45-51, illus.
Selecting slips, stumps, suckers or tops.

e Ayres, G. C. de M.
A ocorrência de plasmodesmas no endosperma de *Coffea arabica* L. var. *typica* Cramer. **(The occurrence of plasmodesmata in the endosperm of *Coffea arabica* var. *typica*.)** [English summary 7 lines.]
Bragantia, 1954, **13**: 281-6, bibl. 5, illus.

f Bentley, J. P. N.
Developments in cane transportation and handling in Natal.
Proc. 30th Congr. S. Afr. Sugar Tech. Ass. 1956, reprinted in *S. Afr. Sugar J.*, 1956, **40**: 345-53, illus.
Methods adopted by Tongaat Sugar Co. with some details of costs.

g Boucher, M.
Comparaison entre quelques viscomètres destinés à la mesure de la viscosité du latex. **(Comparison between various viscometers for measuring the viscosity of latex.)**
Rev. gén. Caoutch., 1956, **33**: 335-41 (French), 362-7 (English), bibl. 7, illus.

h Buzacott, J. H.
Marcotting cane in India.
Cane Grs' quart. Bull., 1956, **19**: 143-5, illus.
Used to multiply breeding canes; technique described.

i Carvalho, A., and Antunes (Filho), H.
Genética de *Coffea*. XXII. Novas observações sobre a influência do alelo *na* na produção dos cafeeiros. **(Genetics of *Coffea*. XXII. Further observations on the influence of the *na* allele on production in coffee plants.)** [English summary ⅔ p.]
Bragantia, 1955, **14**: 267-76, bibl. 8.
Cropping comparisons between *nana*, *murta* and *bourbon* varieties of *C. arabica*.

j Charpentier, L. J.
1954 studies of parasites for sugarcane borer control in Louisiana.
J. econ. Ent., 1956, **49**: 267-8, bibl. 1.
Metagonistylum and *Lixophaga* most effective in the borer-susceptible C.P. 36/13.

k Childerstone, W. J.
Uprooting tea.
Tea Quart., 1955, **26**: 111-12.
Note on costs using a tractor and winch.

l Constable, D. H.
Manuring of rubber.
Adv. Circ. Rubb. Res. Inst. Ceylon **59,** 1956, pp. 7.
Superseding *Circ.* **37**.

m Cowan, I. R.
An introductory discussion on the application of the evaporation concept to the water requirements of plants and the control of irrigation in sugar cane agriculture.
Proc. 1954 Mtg B.W.I. Sugar Tech., Trinidad, pp. 112-15, bibl. 15.
A review; work on sugar cane has been started in Jamaica.

n Davis, T. A.
Curves and twists in coconut stems.
Bull. Indian centr. Coconut Cttee, 1956, **9**: 235-7, illus.
Caused by beetle attack, tapping, diseases, etc.

o Desrosiers, R., and Diaz M., J.
Progreso en la selección de cacao proveniente de semillas para resistencia a la "escoba de bruja". **(Progress in the selection of cacao seedlings for resistance to witches broom.)**
Agric. trop. Bogotá, 1955, **11**: 825-7, bibl. 2.
A programme started in 1949 at Pichilingüe, Ecuador.

p DREW, C. G. A.
Green coffee production and distribution.
Trop. Agriculture Trin., 1956, **33**: 190-200.
World production and marketing.

q VAN ESSEN, W. J.
Some limitations of the gravimetric bromination method for the determination of rubber hydrocarbon. [Indonesian and Dutch summaries ½ p. each.]
Arch. Rubb. Cult. Bogor, 1956, **33**: 231-9, bibl. 7.

r EVERS, E.
Perspectives d'avenir pour l'hévéaculture congolaise. **(Future prospects for rubber cultivation in the Belgian Congo.)**
Bull. Inf. INEAC, 1956, **5**: 79-85.
Ecological data and experience at Yangambi.

s HALL, R. M., AND WADMAN, P. E.
Overhead irrigation with small pumping units. Cost of sugarcane production analysed.
Proc. 30th Congr. S. Afr. Sugar Tech. Ass., reprinted in *S. Afr. Sugar J.*, 1956, **40**: 435-9.

t HARDY, F., AND SMITH, G. W.
The compaction of soil in ratoon cane-fields.
Proc. 1954 Mtg B.W.I. Sugar Tech., Trinidad, pp. 116-20, bibl. 5.

u HARLER, C. R.
Cost of opening-up tea estates. Expenditure in India, Ceylon and Africa.
World Crops, 1956, **8**: 269-72, illus.

v HEINISCH, K. F., AND DE NEEF, J. C.
Sulphuric acid as coagulant in the preparation of rubber. [Indonesian and Dutch summaries ½ p. each.]
Arch. Rubb. Cult. Bogor, 1956, **33**: 217-30, bibl. 17.

w KATYAL, S. L.
Windbreaks will protect your crops.
Indian Fmg, 1956, **6**(1): 36-7, illus.
Species mostly tropical to protect orchards in India.

x KEEGEL, E. L.
Fermentation in relation to heat developed in rolling.
Tea Quart., 1955, **26**: 96-107, bibl. 3.
Effects of temperature on tea quality.

y LAYCOCK, D. H.
A review of the Nyasaland tea industry.
World Crops, 1956, **8**: 255-9, illus.
Including notes on research at Mlanje.

z LOH, C. S.
The advance of sugarcane breeding in Taiwan —the development of P.T.-seedlings. [Chinese, with English summary 1¼ p.]
J. agric. Ass. China, 1956, **13**: 19-27, bibl. 7.

4255.

a LOWE, E. A.
Mechanical clearing of the rubber trees.
Planter, 1956, **32**: 231-7, illus.
Equipment, methods of operation and costs for total clearing before replanting.

b MACKINNON, W.
Costo estimado para el establecimiento, mantenimiento hasta su madurez y costo del equipo de sangría y proceso de una pequeña plantación de jebe (2–5 Has.) en la Zona de Tingo María. **(The estimated cost of establishment, maintenance until maturity and tapping and processing equipment for a small rubber plantation (2–5 ha.) in the region of Tingo María.)**
Circ. Estac. exp. agric. Tingo María **50**, 1955, pp. 7.

c MARAR, M. M. K.
***Glyricidia maculata*—a suitable green manure bush for coconut plantations.**
Bull. Indian centr. Coconut Cttee, 1956, **9**: 193-5, illus.
Including information on propagation, yields and composition.

d MEENAKSHISUNDARAM, D.
Abnormal development of bracts in the spadix of coconut palm (*Cocos nucifera* L.).
Madras agric. J., reprinted in *Indian Coconut J.*, 1955, **8**: 158-60, bibl. 6, illus.
A case of changed sex expression with multi-spathe formation.

e MENDES, J. E. T.
Adubação do cafèeiro. **(Manuring of coffee.)**
Fôlha da Manhã, reprinted in *Bol. Super. Serv. Café, S. Paulo*, 1955, **30**(338): 39-45, bibl. 2.
Recommendations for organic, green and mineral manuring in Brazil.

f MERLE, P.
Mécanisation de la plantation en culture bananière au Cameroun français. **(Mechanized planting of bananas in the French Cameroons.)**
Fruits d'Outre Mer, 1956, **11**: 245-7, illus.
Including cost comparisons with hand labour.

g MORTON, H. C.
A cane-truck trailer.
Cane Grs' quart. Bull., 1956, **19**: 116-17, illus.
A lorry-and-trailer unit carrying 4 empty cane railway trucks.

h NAKASONE, H. Y., AND STOREY, W. B.
Studies on the inheritance of fruiting height of *Carica papaya* L.
Proc. Amer. Soc. hort. Sci., 1955, **66**: 168-82, bibl. 9, illus.
To incorporate early bearing and dwarfing characters into the Solo variety.

i Nethsinghe, D. A.
Contour bunds. Husk bunds for palms in undulating lands.
Ceylon Coconut Quart., 1954, **5**: 223-4, illus.
Trenches filled with husks effective for 7 or more years.

j North Borneo.
Annual Report of the Rubber Fund Board of North Borneo for 1954, stencilled pp. 6.
Including notes on nurseries, seed gardens and planting material.

k Obaidullah Jan, M.
A brief summary of the results of research on sugarcane during the last ten years.
Agric. Pakistan, 1956, **7**: 83-5.
In the N.W. Frontier Province; varieties, culture and nutrition.

Patrick, A. D.
Occurrence of apiose in *Hevea brasiliensis.*
Nature, 1956, **178**: 216, bibl. 4.
In bark tissues.

m Pieris, W. I.
Report on the trial sulphur-dusting of rubber smallholdings in the Kegalla district in 1955.
Quart. Circ. Ceylon Rubb. Res. Inst., 1955, **31**: 92-7.
Using 2 types of dusting machine.

n Plunkett, R. A.
Carbohydrates of the coffee bean.
Diss. Abstr., 1956, **16**: 455, being *Publ.* 15880 of 153 pp.
Separation and identification of carbohydrates, amino acids, etc., in green beans.

o Rao, U. N., Kuppuswami, B. S., and Muthuswamy, S.
A note on some improved types of papaya.
S. Indian Hort., 1955, **3**: 118-19, bibl. 3.
Madhubhindu and Washington the best of 8 varieties for size and flavour.

p Reithel, F. J., and Venkataraman, R.
Lactose in the Sapotaceae.
Science, 1956, **123**: 1083-4, bibl. 3.
In fruits of *Achras sapota*, *Mimusops roxburghiana* and *Ponteria campechiana.*

q Roberts, E. A. H., Cartwright, R. A., and Wood, D. J.
The leuco-anthocyanins of unprocessed tea-leaf.
J. Sci. Food Agric., 1956, **7**: 253-7, bibl. 13.
Accounting for most of the minor polyphenols in fresh leaf.

r Rocchetti, G.
La bananicoltura della Somalia. **(Banana cultivation in Somaliland.)**
Riv. Agric. subtrop., 1956, **50**: 80-91, 165-96, illus.
Acreage in 1955 about 20,000, producing 49,000 tons.

s Rubber Research Institute of Malaya.
Mouldy rot.
Plant. Bull. R.R.I.M., 1956, No. 25, pp. 67-71, illus.
The information in *H.A.*, 23: 3581 brought up to date.

t Schmidt, N. O., and others.
Clarification studies. Some effects of drought on cane juice.
Proc. 1954 Mtg B.W.I. Sugar Tech., Trinidad, pp. 171-81, bibl. 11.
Chemical studies on juices from 2 cane varieties subjected to drought.

u Sills, V. E.
A new technique of assessing quality of cocoa.
Agric. J. Dep. Agric. Fiji, 1955, **26**: 88-91, bibl. 1, illus.
Satisfactory application of the single-pod method described in *H.A.*, 24: 4306.

v de Silva, C. A.
Recommended rubber planting material (1955).
Quart. Circ. Ceylon Rubb. Res. Inst., 1955, **31**: 78-91.
Notes on new clones and their yields.

w Smith, N. M.
The Williams rear-end loader.
Cane Grs' quart. Bull., 1956, **19**: 124, illus.
It can fill a 2-ton truck in about 15 minutes.

x Snethlage, P.
Mechanisatie en ziektebestrijding in de theecultuur. **(Mechanization and disease control in tea growing.)** [English and Indonesian summaries ½ p. each.]
Bergcultures, 1956, **25**: 183-93.
Methods in Indonesia surveyed.

y du Toit, J. L.
Molasses as a fertiliser or soil improver. A review of recent literature.
S. Afr. Sugar J., 1956, **40**: 421-7, bibl. 9.
For sugar cane.

z V[allance], L. G., and H[ughes], C. G.
Applying sulphate of ammonia by aeroplane.
Cane Grs' quart. Bull., 1956, **19**: 142, illus.
Cane top dressed successfully without damage.

4256.

a Vallance, L. G., and Leverington, K. C.
Farm fertilizer trials. Results of the 1955 season.
Cane Grs' quart. Bull., 1956, **19**: 111-16.
Seven NPK and lime trials on various cane farms reported.

b (Wesselmann, R. A.)
Cacao research in Ecuador.
Cacao, 1955, **3**(8): 1-2.
Notes on clones, seedling selection and control of monilia.

c WIGHT, W.
Commercial selection and breeding of tea in India.
World Crops, 1956, **8**: 263-8, bibl. 3, illus.
At Tocklai, Assam.

d WIJEWARDENE, R.
Mechanisation problems on coconut plantations.
Ceylon Coconut Quart., 1954, **5**: 209-17, illus.
Changes in present cultural practices urged.

e WILLIAMS, J. H.
Some analytical methods for minor constituents of sugar cane juice.
Proc. 1954 Mtg B.W.I. Sugar Tech., Trinidad, pp. 167-71, bibl. 5.
Amino acids, inorganic phosphate and reducing sugars.

f WILLS, J. M.
Varietal trends in bananas.
Qd agric. J., 1956, **82**: 142-6, illus.
Descriptions of varieties grown in Queensland.

NOTES ON BOOKS AND REPORTS.

Books.

(*See also* 3264.)

4257. COSTE, R.
Les caféiers et les cafés dans le monde. Tome premier. Les caféiers. (**The coffee trees and coffees of the world. Vol. 1. The coffee trees.**)
Éditions Larose, Paris, 1955, 11×9 in., pp. 381, bibls extensive, illus., paper bound 7,000 fr., cloth bound 8,000 fr., both plus 170 fr. postage.

The author of this important manual is the head of the Coffee, Cacao and Tea Service of the French Office of Overseas Scientific and Technical Research. In two chapters, devoted to diseases and pests, he has had the assistance of P. Vayssière and H. Barat, who are, respectively, Professor at the National Natural History Museum and Director of the Plant Pathology Laboratory of the Madagascar Crop Protection Service.

M. Coste's object is to summarize world research on coffee growing and production, and this he does in 14 chapters devoted to the following subjects: (1) History (pp. 6, bibl. 11). (2) Botany and taxonomy (pp. 17, bibl. 26). (3) Biology (pp. 21, bibl. 68). (4) Ecology (pp. 10, bibl. 30), including the characters and distribution of the chief cultivated varieties. (5) Propagation (pp. 23, bibl. 98) from seed, by cuttings and by grafting. (6) Planting (pp. 19, bibl. 80): preparation of the land, spacing, planting, maintenance and intercropping. (7) Soil conservation (pp. 14, bibl. 48). (8) Shading (pp. 18, bibl. 79): physiological effects, role, shade species, techniques, windbreaks. (9) Training and pruning (pp. 24, bibl. 60): single and multiple stem training, maintenance and rejuvenation pruning. (10) Manuring (pp. 39, bibl. 106). (11) Diseases (pp. 26, bibl. 79): fungal and nutritional, and their control. (12) Pests (pp. 86, bibl. 209): insects, mites, nematodes, etc., and their control. (13) Harvesting (pp. 8, bibl. 12) and yields. (14) Breeding and selection (pp. 33, bibl. 157) including notes on the varieties, lines and clones under investigation at the main research stations throughout the world. Useful lists are provided of 60 manuals on coffee growing, 18 annual reports and periodicals specializing on coffee and some 80 important journals which publish papers on the crop. There are 200 photographic illustrations and over 100 black-and-white drawings including some very clear diagrams of training methods and some excellent entomological drawings.

The chapter on training and pruning may be taken as an illustration of the scope of the work. After describing the natural branching habit of the coffee tree and the physiological background of pruning the author discusses the techniques used in single-stem and multiple-stem pruning as practised in different parts of the world, maintenance pruning and rejuvenation pruning. He then deals with the choice of technique in relation to yield responses (presenting statistics from the Belgian Congo, Kenya, India and Tanganyika), species and other factors such as climate and costs, and finally draws brief conclusions on the whole question. This book should prove to be most useful to coffee growers in all parts of the world. J.D.

4258. DARLINGTON, C. D., AND WYLIE, A. P.
Chromosome atlas of flowering plants.
George Allen & Unwin, London, 1956, 9×6 in., pp. 519, illus., bibl. 2,500, 60s.

The first edition of this work, written by Darlington and Janaki Ammal, appeared in 1945 under the title *Chromosome Atlas of Cultivated Plants* [see *H.A.*, 15: 2065]. In the present edition this concept has been extended to include all the flowering plants; it embraces nearly 18,000 species, giving the somatic chromosome number and main uses of each. This enormous extension has been achieved, without making the book unduly large, by removing the whole of the original introductory portion. In its stead, a separate volume, entitled *Chromosome Botany*, has been produced by Professor Darlington, and this serves as an introduction to the Atlas, whilst being in itself a masterly survey of chromosome behaviour and evolution.

The reviewer was surprised to find no reference under *Gossypium* to the Australian species *G. robinsonii*, the chromosome number ($2n=26$) of which was determined by Douwes and Cuany (1952). Also, although the *G. barbadense* varieties *brasiliense* and *darwinii* are given, no reference is made to the *G. hirsutum* varieties *punctatum* and *marie-galante* both of which are $2n=52$. In this section *G. armorianum* should be *armourianum*. It would, however, be more than surprising if such minor additions and corrections could not be made to a work of this nature.

The second edition of this Atlas will be widely welcomed by all biologists. Professor Darlington and Ann Wylie have performed a task, for which geneticists, cytologists and plant breeders will be especially grateful.

R.L.K.

4259. Good, R.
Features of evolution in the flowering plants.
Longmans, Green, London, 1956, 8½×5½ in., pp. 405, illus., 30s.

There is something distinctly refreshing in Professor Good's approach to evolutionary problems. In this age of specialization it is not surprising that certain, notably zoological, aspects of the subject should have been investigated at the expense of others, resulting as the author points out, in an unbalanced outlook on the problem as a whole and in a tendency to unwarranted generalization. A close study of the evolution of flowering plants seems more than justified if it is accepted that this has to a large extent "set both the pace and the course for much evolution in animals".

In the main chapters on relationships of flowering plants a most ingenious and interesting theme is developed—a cosmological analogy—comparing Monocotyledons and Dicotyledons to two different types of stellar clusters and the related groups within them to planetary and other stellar systems. This concept, although perforce represented diagrammatically in two dimensions, is far more "alive" than those characterized by the traditional genealogical tree.

Specialization of the apparently non-purposive type so widespread among flowering plants is discussed at length and examples such as the floral peculiarities of the Asclepiads are examined as test cases for the validity of the hypothesis of natural selection. Other important questions raised include that of criteria for determining primitiveness of biological features, also the possible origin of strongly similar morphological patterns in families regarded as very distantly related.

A series of clear and beautiful drawings fittingly illustrates the numerous plant types and certain details of flower structure. K.C.

4260. Goodey, T., Goodey, J. B., and Franklin, M. J.
The nematode parasites of plants catalogued under their hosts.
[*Publ.*] *Commonw. Bur. agric. Parasitol.*, 1956, 9½×7 in., pp. 140, bibl. pp. 28, Commonwealth Agricultural Bureaux, Farnham Royal, Bucks., 27s. 6d.

The first edition of this catalogue, prepared by the late Dr. T. Goodey, appeared in 1940. The new edition has been revised, rearranged and brought up to date, and is nearly twice the length of its predecessor. Needless to say horticultural plants are prominent throughout.

4261. James, E. H.
Unusual vegetables.
Hart-Davis, London, 1956, 7½×5 in., pp. 143, 9s. 6d.

To the keen amateur gardener this book will be welcome both by reason of cultivation and cooking instructions. The author discusses not only many vegetables not often seen in English gardens such as salsify, scorzonera and skirret but also 35 herbs, many of them beautiful as well as pungent, and such wild food as ash keys, bracken, horehound and samphire. It may possibly curb the ardour of the would-be bracken eater to know that before he strains and cooks the young shoots, as he would asparagus heads, serving them with melted butter, he must first boil them for 2 hours. Still this little manual provides him with plenty of other less tough subjects into which to press his probing fork.
D.A.

4262. Łucka, M.
Śliwy. **(Plums.)**
Państwowe Wydawnictwo Rolnicze i Leśne, Warsaw, 2nd revised edition, 1955, 8×6 in., pp. 144+1 map, illus., zł. 11.50.

The author deals with the botanical classification of the plum and with its origin. A classification, and detailed descriptions are given of varieties. The uses of plums, methods of cultivation, propagation and breeding are discussed. Plant protection problems are considered.

4263. Ordish, G.
Garden pests.
Rupert Hart-Davis, London, 1956, 7½×5 in., pp. 95, illus., 9s. 6d.

We should hate to think that the author deliberately sets out to shock the pundits or, shall we say, the orthodox, but his remark that "Agriculture and gardening are completely unnatural: they have arisen because man upset the natural balance to his own advantage" certainly gives them something on which to pontificate. And so having upset the balance he has got to fight with tooth and claw, bulldozer and electric shears to keep the unbalance to his own advantage.

Whether you agree with those deplorable sentiments or not, if you are a gardener, you will find his little book immensely helpful. He does not just descant on the beauty of pests and diseases, but he tells you how to avoid or get rid of them in simple terms and with simple materials. And finally he gets his own back on the fairy ring fungus which puts rings on his lawns by letting us into the secret that "it is moreover edible and very pleasant fried with bacon". Of course if he had it for high tea instead of for breakfast he could enhance its flavour with a glass of his own home brew [see *H.A.*, 24: 2090]. D.A.

4264. Pichel, R. J., and Maertens, C.
Les pourridiés de l'hévéa dans la Cuvette congolaise. **(Hevea root rots in the Congo Basin.)**
Publ. Sér. tech. INÉAC **49,** 1956, 9½×6 in., pp. 480, bibl. 335, illus., fr. (Belg.) 400.

The senior author of this book states that he is not a specialist in mycology, and thus places emphasis on the practical aspects and control of root rots rather than on fungus morphology. Although the detailed information provided is based mainly on work at Yangambi, results from Malaya and Indonesia are also included. The text is divided into 4 parts. In the first an historical survey is given on the importance of root rots to rubber growing. The principal root parasites are then described, the chief ones being *Fomes lignosus*, *Armillaria mellea*, *Ganoderma pseudoferreum* and *Fomes noxius*, of which the first two are the most injurious. In the second part the authors deal with the biology of the parasites, covering mode of infection and environmental influence, and also the behaviour of rubber trees when infected. The third part is concerned with the work at Yangambi and describes experimental conditions and observations on the occurrence of root rots. Lastly the efficiency of control methods and the economic aspects of rot control are discussed.

4265. THE ROYAL HORTICULTURAL SOCIETY. (SYNGE, P. M., AND OTHERS.)
Dictionary of Gardening. Supplement.
Clarendon Press, Oxford, Cumberlege, London, 1956, 11×8 in., pp. 334, illus., 42s.

The Royal Horticultural Society has now issued the First Supplement to their invaluable *Dictionary of Gardening*. Divided into two parts, the first contains lists of recommended garden varieties of flowers, fruits, and vegetables, each in its own section, and the second records additions and corrections to the main work with various articles on subjects omitted previously, or, by reason of recent progress, requiring fresh treatment. Garden hybrids by recent decree of the International Committee of Horticulture are henceforth to be known by the unlovely name of "cultivar", the term "variety" being now reserved for varietal forms occurring in the wild. Truly the language of science becomes daily more barbarous. The more earthy of the gardening brotherhood will find this uncouth Esperantoish combination difficult to assimilate. It is doubtful if they will try. The decision came too late for the changes to be included in this volume, a reprieve for which the compilers show a discreetly veiled gratitude. The lists of recommended "cultivars" (to try it on the dog) are selections of the best and most reliable varieties in the opinion of those who have studied or specialized in these particular plants. It does not follow that the reader and the specialist will always agree, though differences of opinion are more likely to concern omissions than inclusions. Having nothing to sell, these lists provide reliable descriptions untinged with commercial enthusiasm and thus can be accepted without the usual grain of salt. Some are comprehensive to a degree, others less so. The rose list describes 500 varieties, which should be enough. The viola list of 45 names seems less adequate, but possibly only because it omits several of the present writer's favourites. The fruit section provides comprehensive descriptive lists of all the main varieties (e.g. 156 apples, 72 pears, and so on), each followed by a short list of the varieties recommended as containing the four most necessary characters, those of productivity, hardiness, suitable growth and fruit quality. A reprint is included of Crane and Brown's fertility rules for planting. The vegetable lists read like a seedsman's catalogue, but one from which all chaff has been winnowed. The potato lists give the "form" of each variety by noting any idiosyncrasies which might influence choice.

In Part 2 the additions and corrections call for no special comment. The special articles, however, will prove valuable, in particular those on organic fungicides (inorganic fungicides were dealt with in the main volume), gas and fog injury, electrical heating of frames and on some newer insecticides, to mention a few. There are also 13 columns setting out the International Code of Nomenclature for Cultivated Plants as devised by the 13th International Horticultural Congress in 1952 or by a committee thereof, in a gallant and ingenious attempt to standardize the naming of garden hybrids. The complications are such that, like the man in that other Floral Dance, we could only stand and stare, but legal minds should love it.

This Supplement fully upholds the high standard set by the main volume, that is to say that it is a worthy adjunct to the most authoritative and complete book on English gardening so far produced. G.St.C.F.

4266. SAAKOV, S. G.
Palms and their cultivation in the U.S.S.R.
[Russian.]
Izdateljstvo Akademii Nauk SSR, Moskva, Leningrad, 1954, 10½×7 in., pp. 319, bibl. 7 pp., illus., roubles 20.80.

This well documented and profusely illustrated book consists of 3 sections. The first (pp. 8–44) deals with the general characteristics and geographical distribution of palms, the second (pp. 45–193) with their morphology and classification, and the third (pp. 194–312) with their cultivation in the U.S.S.R. In the Soviet Subtropics 4 species of *Butia*, 4 of *Phoenix*, 2 each of *Washingtonia*, *Livistona*, *Sabal*, *Erythea*, *Trachycarpus* and 1 each of *Jubaea*, *Rhapidophyllum* and *Chamaerops* are to be found. These grow mainly on the Black Sea coast of the Caucasus and with a few exceptions are of ornamental interest only. Notes are given on the frost resistance of these species and the cultivation of palms, both indoors and in the open, is described. A short section by Z. G. Beloseljskaja, deals with the pests of palms in the U.S.S.R. and their control.

4267. SANECKI, K. N.
Wild and garden herbs.
Collingridge, London, 1956, 8½×5½ in., pp. 76, illus., 15s.

Interest in the growing of pot and medicinal herbs is nowadays distinctly weak. Possibly because the majority have little garden value, meaning colour, or because few know what to do with them when they have grown them and those who do know realize that it would be easier, cheaper and probably safer to pop round to the chemist or grocer and buy the sublimated version in a packet. Should an urge towards herb growing arise, and presumably there are enough people who feel this way to justify the book, then Mrs. Sanecki is the one to consult and it can be very agreeably done by way of this volume. Cultivation problems are practically nil, but proper drying and storing in any quantity would seem to provide enough headaches to test the reputation of a good sized plot of the costmary recommended for this affliction. However, there are clear directions in the book, and if after perusal the reader still wants to dry herbs—well, good luck to his enterprise! Useful features are the excellent line drawings by Miss D. S. Ratman illustrating some 50 of the 100 or so herbs discussed. None is verbally described. Discussion is confined to properties and uses, with the inclusion of an occasional recipe, e.g. dandelion tea, some traditional lore and a word on cultivation and after-treatment where any special attention is needed. The book is brightly written and easy to read. The jacket blurb extolling it as "a guide book for the beginner and an anthology for the connoisseur" makes a break with tradition by not exaggerating. G.St.C.F.

4268. Sokolov, S. Ja. (Editor).
Trees and shrubs of the U.S.S.R. III. Angiospermae, Families Trochodendraceae-Rosaceae. [Russian.]
Izdateljstvo Akademii Nauk SSSR, Moskva, Leningrad, 1954, 10½×7 in., pp. 872, bibl. 7 pp., illus., roubles 50.

In this as in the previous volumes the sequence of families follows the system used by Engler. The present volume, comprising 17 families, begins with Trochodendraceae and concludes with Rosaceae. Species which are cultivated or are suitable for cultivation in the U.S.S.R. are characterized in detail, those recommended for trial are treated in less detail and the more obscure and less promising material is dealt with only briefly. Thus genera and species of Rosaceae occupy 560 pages, while those of the other 16 families take up only 247 pages. The indices of Russian and Latin names provided should prove useful to all who deal with Russian literature.

4269. Steinmann, A., and Wiersum, L. K.
Ziekten und plagen van Hevea brasiliensis in Indonesië. **(Diseases and pests of *Hevea brasiliensis* in Indonesia.)**
Centr. veren. Proefstat. overj. Cult. Indonesië, 1955, 9½×6 in., pp. 114, bibl. 74, illus.

The original book by A. Steinmann was published in 1925, and summarized contemporary knowledge on the recognition and control of diseases and pests of rubber. It was intended to revise the book in 1939, but the project was stopped by the war. The present edition has been completely revised, principally by Dr. L. K. Wiersum, and the bibliography is limited to publications issued during 1940–1954. In doing this the needs of the planter have been primarily considered, and many botanical, entomological and mycological details have been omitted. Pests and diseases are grouped according to the organ they attack, viz. roots, tapping surface, trunk and branches, and leaves, and there is a section on nursery ailments. At the beginning of each section there is a table listing the main symptoms and these are then more fully described with the aid of coloured plates and photographs.

4270. Wells, J. S.
Plant propagation practices.
MacMillan, New York and London, 1955, 9×6 in., pp. 344, illus., $7.50 or 42s.

Mr. Wells sets out to provide a brief introduction to fundamental principles governing successful plant propagation. This he achieves and far more, for the basic principles, so clearly appreciated by him, are stated in simple direct terms and related to daily practices. Thus the chapter on the interactions of water, heat and light shows clearly that a thorough understanding of these factors is essential to successful plant propagation.

First he considers you should choose your site in relation to natural features and to trading facilities. Next make full use of the advisory services, even though they are free; and then conserve the top soil, if necessary by contour planting, and maintain soil structure by manuring and cover-cropping. If this advice were followed there would be less heard of "played out" nursery soils. There is a useful chapter on propagating structures with working drawings and photographs. Sash houses are advocated, being both economical and efficient. Lath houses and portable shading are essential and their construction and use are carefully described. As regards the heating of propagating structures we are reminded that the "prime control" is the ventilator, while the temperature of the rooting medium is best controlled by thermocouples in the medium and not in the air above.

Seed propagation, from collecting the seed, storage or pre-treatment to sowing and transplanting are briefly but adequately covered with the help of a useful seed propagation chart. There is a valuable section on propagation by cuttings of all kinds, covering heat regimes, hormone treatment, wounding and rooting media, time of taking, and type of cutting, with brief notes on special procedures. The author is an enthusiast on the use of mist for rooting cuttings under glass and in the open, and records more than 80% success with most types of evergreen. The customary methods of propagation by grafting are given, the value of this section lying in the numerous practical details and hints given in both text and tables. Layering shrubs and trees, including the popular air-layering technique, is also described. A separate chapter deals with the production of a "liner" for field planting on a large scale and pictures depict the use of mechanical planters. The more important ornamental species, including acers, rhododendrons, hollies, magnolias and various conifers, are treated in considerable detail, and there is a month-by-month work programme starting in June, the beginning of the propagator's year. An appendix affords a guide to literature and to sources of the necessary apparatus.

Mr. Wells has provided a readable book of particular value to those who have already some practical knowledge. He has searched after knowledge, sorted it and used it to increase the efficiency of his nursery. Having done that he has given us this excellent and useful summary of his experiences. R.J.G.

Annuals and reports.

(*See also* 3699, 3943, 4023.)

4271. Balsgård (Nybom, N., and Oldén, E. J.).
Föreningen för Växtförädling av Fruktträd. Verksamhetsåret 1955. **(Annual Report of Balsgård Fruit Breeding Institute for 1955)** [English summary 2½ pp.], 1956, pp. 24, bibl. 4.

Breeding work in progress is discussed by the new Director of the Institute, N. Nybom (pome fruit and berry bushes, pp. 7–12), and by E. J. Oldén (stone fruit, strawberries, rootstocks and hazel, pp. 12–15).

4272. Cameroons Development Corporation.
Annual Report Cameroons Development Corporation for 1955, Bota, Victoria, pp. 33.

Brief notes concern the work of the new Research Division on fertilizers for bananas, cacao and rubber, on selection of cacao, and on the leaf spot and cigar end diseases of bananas and the leafless twig disease of cacao.

4273. EUROPEAN AND MEDITERRANEAN PLANT PROTECTION ORGANIZATION (EPPO).
Progress Report of the European and Mediterranean Plant Protection Organisation, 1955-56, Paris, 1956, pp. 39 [French and English].

Among the diseases and pests being studied are San José scale, tristeza and xyloporosis of citrus, Mediterranean fruit fly, fall webworm and muskrat.

4274. FAO.
Yearbook of Food and Agricultural Statistics, 1955. Vol. IX, Part 1. Production. [English, French and Spanish], Rome, 1956, pp. 427, $3.50 or 17s. 6d.

This detailed publication follows the pattern adopted in previous years [*H.A.*, 23: 4742; 24: 4470]. Section III on crop acreages and production has been extended to include data on pears, onions and palm oil and palm kernels, tomatoes and pineapples. Information on the consumption of the principal pesticides has been restored to Section VI.

4275. FRIESDORF.
Festschrift anlässlich des 25 jährigen Bestehens der Gärtnerlehranstalt der Landwirtschaftskammer Rheinland zu Friesdorf-Bad Godesberg, und XXVII Tätigkeitsbericht. **(Jubilee Publication celebrating the 25th anniversary of the Horticultural Department at Friesdorf-Bad Godesberg, and 27th Annual Report),** [1955], pp. 132, illus.

Articles included in this issue include several on various aspects of chrysanthemum growing. Experimental results also briefly reported include: Construction of, and scheme of rotation for, a moveable glasshouse in flower growing; experience with hot air heating of glasshouses, costs and effects on plants; variety trials with petunias; and studies on fruit trees [see abstracts 3348 and 3356].

4276. GEISENHEIM (STEINBERG, J.).
Lehr- und Forschungsanstalt für Wein-, Obst- und Gartenbau Geisenheim (Rheingau). Bericht für das Rechnungsjahr 1954/55. **(Annual Report of Geisenheim Horticultural College and Research Station for 1954/55),** pp. 107, bibls.

Investigations reported include: *Department of Botany:* Flower biology of walnut, almond, peach, plum and apple; studies on the pigment pelargonidin in delphinium; iris breeding. *Department of Plant Diseases:* Studies on the origin of field resistance of vines to *Phylloxera* and of the root cap as an indicator of tolerance to the pest; dying back of *Statice tatarica* and *Erica* spp. *Department of Soil Science and Plant Nutrition:* Culture of *Erica gracilis* and *Azalea indica*; mulching tomatoes; fertilizer trials with fruits and vegetables. *Department of Vine Breeding and Propagation:* French hybrid trials; rootstock compatibility studies; grafting by machine; protective materials for graft unions; studies on delayed bud growth from grafted vines; effect of length of scion on union; the effect of angle of cut on callus formation in whip grafting. *Department of Viticulture and Winemaking:* Manurial, spacing, rootstock and clone trials. *Department of Fruitgrowing:* Studies on rooting of rootstocks; selection of easily-rooting walnut stocks and of *Juglans nigra* seedling stocks; walnut grafting in the open; storage of early fruit; studies on green manures. *Department of Horticulture:* Variety trials with flowers grown under glass and in the open; a compost-mixing machine.

4277. HELLYER, A. G. L.
Amateur Gardening Diary, 1957.
Collingridge, London, 1956, pp. 160, 7s. 2d.

The compiler offers his usual bunch of extremely useful items of information on research, advisory services, literature, weed control, import regulations and other horticultural subjects in this country. About 54 pages are information and the rest diary.

4278. INDONESIA.
Verslag over 1954 van de Proefstation der Centrale Proefstations Vereniging. **(Report for 1954 of the Experiment Station of the Central Union of Experiment Stations),** [Djakarta Kota], 1955, cyclostyled, pp. 143.

Part II of the report includes notes on studies of anatomy and physiology, genetics, diseases and cultural operations in rubber, coffee, tea, cinchona, cacao and tobacco. In the general section, work on mechanization, manuring, chemical weed control, cover crops and soils is reported.

4279. INTER-AMERICAN INSTITUTE OF AGRICULTURAL SCIENCES, TURRIALBA, COSTA RICA.
Al servicio de la agricultura en las Américas, Informe anual 1954-55. **(In the service of agriculture in the Americas. Annual report 1954-55),** pp. 88, illus.

A brief summary of research and extension work with no detailed results. The research programme includes the following: *Coffee:* selection; variety trials; soil cultivation and mulching; spacing; nutrition; disease control; quality studies. *Cacao:* disease control; physiological studies; propagation. *Manila hemp:* nutrition; soils; pest and disease control. *Rauwolfia* spp.: cultivation studies. *Variety collections* of fruit trees, sugar cane and other economic crops.

4280. JAMAICA.
Investigations 1954.
Bull. Dep. Agric. Jamaica **54,** 1955, pp. 130, 3s. 6d.

Investigations reported include: *Economic entomology:* Pests of sugar cane, citrus, mangoes and roses. *Field crops:* Observations on several fibre crops; sisal fertilizer and spacing trials. *Plant pathology:* Control of banana leaf spot. *Soils and fertilizers:* Krilium tests. *Cultivated trees, shrubs and vines:* Banana breeding, propagation and management; cacao introduction, propagation and variety trials; cashew selection; citrus propagation and management; coconut management and disease studies; coffee cultivation and selection; peppermint oil studies; oil palm variety testing; pineapple introduction, testing, propagation and fertilizer trials.

4281. JOHN INNES.
46th Annual Report of John Innes Horticultural Institution, 1955, Bayfordbury, 1956, pp. 36, 3s.

The report includes notes on work in the various sections. *Plant Breeding:* Progress in breeding new varieties of apples, pears, strawberries and blackberries; genetic analysis of *Prunus avium* and *P. persica*; cytology of the progeny of Beurré Bedford; induced mutants in crop improvement; a species collection of the genus *Rubus* and apomixis in *Rubus* spp.; rose rootstock trials. *Genetics:* Self-compatibility in cherries; storage of vegetable seeds in CO_2. *Physiology and plant culture:* Glasshouse climate, growth and development of tomatoes; electrical bench warming; methods of raising plants. [See also separate abstracts.]

4282. DE KEIJZER, R.
Jaarverslag van de Bedrijfsvoorlichtingsdienst voor de Tuinbouw in de Provincie Oost-Vlaanderen. Deel II. 1955. **(Annual Report of the Advisory Service for Commercial Horticulture for East Flanders [Belgium]. Part II. 1955)**, cyclostyled, pp. 124.

The experiments described are aimed at solving the problems of local growers, but they are also of wider interest. The problems investigated include soil sickness affecting both a tree and shrub nursery and begonias, short-day treatment for begonias, artificial light for *Aechmea*, ferns and strawberries, a runner bean variety trial, electrical soil warming for growing young plants and melons, comparative variety trials with onion setts and leeks, a variety trial with early tomatoes under glass without heat, and disease control in strawberries.

4283. KENYA.
Annual Report of the Kenya Department of Agriculture for 1955, Vol. I, 1956, pp. 70, sh. 3/50.

Coffee: control of *Leucoptera* spp., *Parasa virida*, *Niphadolepis alianta*, *Diarthrothrips coffeae* and *Antestiopsis* spp.; weed control, manurial and mulching trials; anti-leaf-fall Cu and non-Cu fungicide and hormone trials; soil N and N nutrition studies; weed control; green vein chlorosis correction by chelates. *Pyrethrum:* breeding; bud disease (*Ramularia bellunensis*); weed control; stripping, cutting back and fertilizer trials. *Sisal:* fertilizer, planting material, grading, curing, spacing, *Agave* hybrid and herbicide trials. *Sugar:* varietal, fertilizer, herbicide and spacing trials. *Horticulture:* pineapple cultural trials; youngberry growing; tomato trials for purée production, canning pea trials.

4284. MAURITIUS.
Annual Report of the Mauritius Department of Agriculture for 1954, 1956, pp. 97, R. 1.25.

Investigations are reported on sugar cane, *Furcraea*, tobacco (use of J.I. composts, manuring, irrigation, disease-resistant hybrids, curing) and tea.

4285. MURWIN, H. F.
Progress Report Harrow Experimental Farm, Ontario, 1947-1954, 1956, pp. 51, illus.

Most of the crops grown on this Experimental Farm are agricultural, but there are sections working on tobacco [see abstract 3857] and horticulture. *Horticulture*, pp. 27-36 (Harrison, T. B., and Ounsworth, L. F.). *Peaches:* Varieties are being evaluated with respect to processing and fresh fruit qualities and susceptibility to bacterial spot (*Xanthomonas pruni*). Among seedling rootstocks the best winter survival was shown by a red leafed sport of Carolina Natural known as Rutger's Red Leaf; cuttings of this variety were rooted under constant mist but proved difficult to establish. Mounding of young trees in the autumn has been found to do more harm than good. In fruit thinning studies with several chemicals there have been marked varietal differences in response. For mechanical thinning clubs with rubber-hose ends have proved as efficient as, and much quicker than, hand thinning. *Tomatoes and melons:* The results are recorded of trials on new field varieties of early tomato and muskmelon.

4286. O.E.E.C.
The handling and marketing of fruit and vegetables at grower-shipper level. E. Wattez, The Hague, 1954, 9½ × 6 in., pp. 224, illus.

This is the English version of a report on a training course sponsored by the European Productivity Agency of O.E.E.C. by arrangement with the United States Foreign Operations Administration. Lectures were included on the following subjects: Quality of the crop as influenced by different factors during the growing season and by harvesting methods, by J. H. M. van Stuivenberg, who considers both external appearance and internal qualities; The commercial standardization of fruit and vegetables on a European basis, by M. Normand; Packing and packing materials, by W. S. Duvekot; Packing stations and methods of packing, by G. Hogeweg, covering economics and organization; Standardization of packaging, by C. Hillenius; Storage by ventilating and artificial refrigeration, by T. van Hiele; Precooling, cooled transport and top-icing, by M. Anquez, describing French methods and equipment for refrigerated storage and transport; Transport and marketing of horticultural produce, by E. W. B. van den Muijzenberg; International transport of fruit and vegetables, by F. E. Eichholtz; Layout of auction buildings, by T. van Hiele. [See also abstract 3238.]

4287. OFFICE DE LA RECHERCHE SCIENTIFIQUE ET TECHNIQUE OUTRE-MER (COMBES, R.).
Organisation—activitié 1944-1955. **(Organization and activities of the Office for Scientific and Technical Research in the French Overseas Territories, 1944-55)**, Paris, 1955, pp. 182, illus., maps.

This office (O.R.S.T.O.M.) was established in 1943 to be responsible for and to co-ordinate scientific research in the French overseas territories. In this report the Director gives an account of its aims and of the foundation and work (some of it agricultural) of the 10 institutes established under its direction in overseas and metropolitan France. [For an earlier report (1948-50) see *H.A.*, 22: 3219.]

4288. SCOTTISH HORTICULTURAL RESEARCH INSTITUTE.
Third Annual Report, 1955-1956, Mylnefield, 1956, pp. 40.

Work in progress includes: *Pomology:* raspberry cultivation and breeding studies; strawberry variety trials, June yellows observations and Climax defoliation; currant variety trials; apple and plum variety-rootstock trials. *Vegetable culture:* variety trials with french beans, spinach, brussels sprouts and canning peas; breeding cabbages, brussels sprouts and dwarf beans; occurrence of rogues in January King cabbage. *Crop physiology:* apparatus to record light intensity; raspberry dormancy studies; effect of low temperature and increased photoperiod on strawberry plants. *Genetics:* June yellows of strawberry. *Plant pathology:* raspberry viruses and the production of virus-free stocks; cabbage root fly control; biology of green capsid bug. *Mycology:* host-parasite relationships in strawberry red core disease; spore trapping of *Botrytis cinerea*. *West of Scotland Unit* (*Auchincruive*): strawberry breeding, including testing of seedlings for fungus resistance; mycological studies on *Phytophthora fragariae*; June yellows; Climax nutrition; raspberry breeding. *Variety trials of vegetables in Scotland:* summer spinach at Invergowrie 1953–1955.

4289. SHELL COMPANY OF VENEZUELA.
Resumen de las actividades del Servicio Shell para el Agricultor, 1954. **(Summary of the activities of the Shell Service for the Farmer for 1954),** Compañía Shell de Venezuela, Cagua, Aragua, pp. 51, illus.

The Shell Service for the Farmer, a branch of the Shell Company of Venezuela, was established in Cagua in 1952 with its own laboratories and trial grounds of 47 ha. It is run as a non-commercial concern to develop, through research and extension work, the agriculture of Venezuela. It consists of 5 departments: agronomy, entomology, plant pathology, agricultural engineering and soils. This is the first annual report published by the Service. Results are briefly summarized of work on the introduction of vegetable varieties and the control of weeds, pests and diseases in vegetables, citrus, bananas, sugar cane, tobacco, sesame, oil palms and coffee. The illustrations are outstanding.

4290. SOCIÉTÉ DE POMOLOGIE, QUÉBEC.
Rapport annuel de la Société de Pomologie et de Culture fruitière de la Province de Québec 1954. **(Annual Report of the Pomological and Fruitgrowing Society of the Province of Quebec 1954),** Montreal, pp. 103.

Among articles of general interest are separate reports on apple pruning, scab control, orchard manuring, apple varieties, biological control of orchard pests, and mechanization.

4291. UGANDA PROTECTORATE.
Annual Report of the Uganda Department of Agriculture for 1954, Entebbe, 1955, pp. 138, illus., Shs. 5/50.

In this report [as in that for 1953 which, together with the 1952 report, has also just been received] the arrangement is different from that used in previous years, departmental activities being reported on an individual province basis instead of for the protectorate as a whole. Research activities, reported from the Botany, Chemistry and Entomology Sections, include the following subjects: *Coffee varieties:* Yield comparisons of varieties of 3 types of robusta coffee. *Coffee diseases:* Spraying arabica coffee with 0·3% Perenox at monthly intervals improved the health of the trees, increased yields and gave satisfactory control of leaf rust (*Hemileia vastatrix*). *Ratoon stunting disease of sugar cane:* Immersion of setts in a water bath at 52° C. for 1½ hours gave effective cure. *Nitrogen and mulch trials:* Responses of beans to grass mulch were consistently positive, yields being increased by an average of 24%. Addition of N increased the mulch effect at 1 site but decreased it at 2 others. *Tobacco root-knot eelworm:* A 3-year study has shown that this pest, previously known as *Heterodera marioni*, really comprises several species of *Meloidogyne*. They are found even in land which has not been cultivated for many years but are not important at altitudes above 5,500 ft. Seedbed injections of Shell DD and Soil Fumigant have greatly increased the stand and growth of seedlings and increased subsequent yields. Injections round transplant sites in the field have reduced infestations but have not significantly affected yields. *Coffee pests:* Pyrethrum dusting has given promising results against *Antestia* bugs.

4292. UNIVERSITY OF NOTTINGHAM.
Report of the School of Agriculture, University of Nottingham, 1955, pp. 79.

This is the first report from the Nottingham School of Agriculture, established at Sutton Bonington in 1947. It is hoped to produce further reports annually. It consists of a brief summary of the progress made in the various sections, followed by short papers on particular aspects of the work. Papers of horticultural interest include "The use of controlled water-regimes in experimental work", by J. P. Hudson [see *H.A.*, 23: 3162; 25: 633, 653, 654; and 26: 719]; "Studies of basic cultural operations. 1. Seed sowing and transplanting", by W. M. Dullforce and W. Heydecker [see *H.A.*, 25: 502, 504; and 26: 2741]; and "Labour productivity in vegetable production", by K. A. Ingersent and T. K. Warley.

4293. WELLESBOURNE.
Sixth Annual Report of the National Vegetable Research Station, Wellesbourne, Warwick, 1955, 1956, pp. 72.

Brief reports of work in progress are presented for each of the 8 sections. Papers on spring cabbage varieties and on pre-emergence weed control in onions have been abstracted separately.

Noted.

4294.

a ***Amateur Gardening Handbooks,*** issued by Collingridge, London, 1956, pp. 92 each, illus., 4s. each.
Crane, H. H., Fruit.
Hellyer, A. G. L., Garden pests and diseases.
Stewart, N., Strawberries.

b BRITISH GUIANA.
Annual Report of the Director of Agriculture for the year 1954, 1956, pp. 58.
Including notes on sugar cane investigations.

c Bundesanstalt für Qualitätsforschung, Geisenheim (Schuphan, W.). *Bundesanstalt für Qualitätsforschung pflanzlicher Erzeugnisse, Geisenheim/Rheingau. Tätigkeitsbericht 1955/56.* **(Annual Report of the Federal Institute for Quality Research in Plant Products, Geisenheim 1955/56)**, 1956, pp. 32, illus.
Including studies on quality and nutritional value of fruits and vegetables.

d Canada Department of Agriculture. *Report of the Director of Science Service for the year ended March 31, 1955,* pp. 68.
Reprinted from Report of the Minister of Agriculture [see *H.A.*, 26: 2323].

e Cheshunt. *39th* and *40th Annual Reports Cheshunt Experimental and Research Station for 1953* and *1954,* 1954, pp. 86, illus., and 1956, pp. 69, illus.
See separate abstracts, mainly in Vegetables Section.

f Hong Kong. *Annual Departmental Reports by the Director of Agriculture, Fisheries and Forestry, Hong Kong, for 1954-55,* pp. 103, illus., $6.

g Horticultural Education Association. *H.E.A. Annual Report, 1955,* 1956, pp. 99, obtainable from Editor, H.E.A., 65 Tilehurst Road, Reading, Berkshire.
Administrative details and conference reports.

h Imperial College of Tropical Agriculture. *Report of the Governing Body and the Principal's Report of 1954-55,* 1956, St. Augustine, Trinidad, and 40 Norfolk Street, London, W.C.2, pp. 59.

i Jamaica. *Annual Report of the Department of Agriculture, Jamaica, for 1954,* 1955, pp. 69, 4s.
See also abstract 4280.

j Klan, Z. *Srovnávací anatomie plodů rostlin okoličnatých oblasti republiky československé. (Anatomický klíč.)* **(Comparative anatomy of the fruits of umbelliferous plants growing in the Czechoslovak Republic. (Anatomical key.))** [English summary 8 pp.]
Czech Academy of Sciences and Arts, Prague, 1947, 10½×7 in., pp. 210+viii, bibl. 36, illus., Kčs. 160.

k Long Ashton. *Annual Report of the Agricultural and Horticultural Research Station, Long Ashton, Bristol, 1955,* 1956, pp. 224.
See abstracts of individual papers.

l Luck, J. M. (Editor) and others. *Annual Review of Biochemistry, Vol. 25.* Annual Reviews Inc., California, 1956, pp. 794, $7 in the U.S.A., $7.50 elsewhere.

m N.A.A.S. *Experiments in horticulture in progress at the Experimental Horticulture and Demonstration Stations, October 1955–September 1956,* 1956, pp. 79.
Lists showing crops and types of study, aims and location.

n N.A.A.S. *N.A.A.S. provincial experiments in horticulture. Summary of experiments in progress, 1955-56,* 1956, pp. 35.
Tabulated information only.

o N.A.A.S. *Station* and *Farm guides to Experimental Horticulture Stations Husbandry Farms* or *Demonstration Stations for 1956.*
Bryn Adda, Bangor, N. Wales, pp. 21.
Cleppa Park, Newport, Mon., pp. 25.
Efford, Lymington, Hants, pp. 23.
Kirton, Boston, Lincs, pp. 17.
Rosemaund, Preston Wynne, Herefordshire, pp. 47.
Stockbridge House, Cawood, Selby, Yorks, pp. 19.

p N.A.A.S. (Luddington). *Report of the Luddington Experimental Horticulture Station for 1955,* Stratford-on-Avon, 1956, pp. 76.
See separate abstracts.

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